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An Index of Unemployment Insurance Disincentives

by

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Abstract

This paper presents an index that allows one to compare across space and time the disincentives created by different unemployment insurance systems. The index is constructed by calculating the extent to which a given UI system would cause unemployment in a neo-classical labour market. The index can therefore be used as a predictor of one component of the 'natural' rate of unemployment.

The index nests several specifications which have been popular in the literature, and also incorporates features that have not yet been properly modelled, such as maximum insurable earnings limits, the repeat user provisions of 1979-90, and the seasonal benefits system of the pre-1971 UI system. We are also able to incorporate the effects of the changes introduced in the February 1994 Budget and the new Employment Insurance (EI) system, proposed by the federal government in December 1995.

When applied to Canada, our index shows that UI disincentives have now fallen back to their pre-1971 level. Both the 1994 Budget and the new EI proposals make significant reductions in the disincentive effects of unemployment insurance. There are still substantial disparities across regions, something that was not true before 1971. However, the proposed EI system would reduce these disparities as well.

Résumé

Ce document présente un indice permettant de comparer, à travers le temps et l'espace, les effets désincitatifs de différents systèmes d'assurance-chômage. L'indice est construit en calculant l'importance du chômage induit par le système d'assurance-chômage selon un modèle du marché du travail néoclassique: il peut donc être utilisé comme un indicateur d'une des composantes du taux de chômage naturel.

L'indice imbrique différentes spécifications qui ont été populaires dans la littérature, et incorpore également des éléments qui n'avaient pas encore été bien modélisés, tels que les limites sur les gains assurables, les règles concernant les usagers fréquents de 1979-90, et les bénéfices saisonniers du système d'assurance-chômage prévalant avant 1971. L'indice prend également en compte les effets des changements du Budget de février 1994 et du nouveau régime d'assurance-emploi tel que proposé par le gouvernement fédéral en décembre 1995.

Lorsque l'indice est utilisé pour le Canada, il indique que les effets désincitatifs du système d'assurance-chômage sont maintenant redescendus au niveau prévalant avant 1971. Tant les changements du Budget de 1994 que les nouvelles propositions du régime d'assurance-emploi ont réduit significativement les effets désincitatifs de l'assurance-chômage. Il y a encore des disparités régionales substantielles qui n'étaient pas présentes avant 1971. Cependant, le nouveau régime d'assurance-emploi devrait réduire aussi ces disparités.

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As far as the laws of mathematics refer to reality,
they are not certain, and as far as they are certain,
they do not refer to reality.

- Albert Einstein.

I. Introduction

It is now more than fifty years since unemployment insurance was introduced into Canada, but the controversy about its economic effects is perhaps greater than at any time in its history. Indeed, the Federal Government is currently proposing to replace the existing Unemployment Insurance program with a new Employment Insurance program, in part because of a belief that the present system 'is out of date' and 'discourages adjustment'[1]. In these debates about the effects of UI,[2] researchers have often had recourse to indices of UI disincentives in order to summarise the overall impact of the many different facets of this large and complex program. However, as Atkinson and Micklewright (1991) argue, precisely because UI is such a complex system, one has to be careful when modelling its effects. In this paper we set out to take a careful look at some existing measures of UI disincentives, and to adapt or extend these indices in order to better reflect the nature of the labour market in Canada. We do this from both a theoretical and an empirical perspective.

It is appropriate to begin with the question: what do we want from an index of UI disincentives? What are we trying to measure? In this regard it is useful to distinguish between the *generosity* of a UI system and the *disincentives* that it creates. The first concept relates to the social *benefits* of UI: the extent to which benefit payments provide sufficient income protection for those out of work. UI generosity would therefore depend upon factors such as the number of dependents that a claimant had to support or the local cost of living. The second concept relates to the social *costs* of UI: the extent to which the system creates distortions in the labour market that impede its proper functioning. An index of UI disincentives might therefore include measures such as the ratio between benefits and the wage a claimant might earn while in work. This measure would largely be irrelevant in determining how generous a system is, because it has no bearing upon the utility that individuals derive from the money that they receive whilst unemployed.

Measures of the disincentives created by a UI system are also distinct from measures of the fiscal impact of UI. An example of the latter would be total spending on UI as a percentage of GDP, or average UI benefits per unemployed worker. These figures might be useful for estimating the impact of UI upon aggre demand, for example. Indices of UI disincentives on the other hand try to incorporate those aspects of the UI system

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[1] Government of Canada (1994).

[2] For simplicity, we will use the abbreviation UI to represent both the old Unemployment Insurance program and its successor the Employment Insurance program.

that affect agents' labour market behaviour, in order to measure the behavioural effects of unemployment insurance upon the decisions of employers and employees. In this context what is relevant is not the absolute level of disincentives of the system, but its disincentives *relative* to the other options available to the agent. Thus a key feature of measures of UI disincentives — as opposed to measures of the fiscal impact of UI or the generosity of benefits — is that it is a relative rather than an absolute measure.

Another useful way of distinguishing between different measures of disincentives is to ask whether a measure is an ex ante or an ex post measure of disincentives. An ex post measure, such as average benefits divided by average wages, attempts to quantify the disincentives of the UI system *given* agents' reactions to it. In contrast, an ex ante measure, such as the statutory replacement rate, is more of an exogenous parameter. It provides information about the rules of the game, rather than incorporating agents' reactions to these rules. From an econometric perspective the latter is clearly preferable as a regressor, as it minimizes the degree of potential endogeneity bias.

Construction of an index of disincentives is complicated by the fact that the UI system in Canada has many different parameters, including coverage, eligibility and benefit duration. In order to combine these aspects of the program into a single index we require some unifying concept that will allow us to compare these factors. Because the main use of indices of this kind is to measure the potential distortionary effect of UI upon unemployment, it seems reasonable to use potential UI-induced unemployment as the common unit of measurement by which the various different aspects of the system may be compared. Thus the index measures the extent to which the UI system may raise unemployment in a classical labour supply framework. Our motive for using the classical framework is not necessarily that we believe most unemployment is structural, but rather because we are interested in that component of unemployment which is due to imperfections in the labour market, rather than cyclical unemployment caused by aggregate demand fluctuations. Much empirical work in economics has attempted to distinguish the relevant proportions of these different types of unemployment. The classical model also has the merit of tractability: it is much easier to obtain closed form solutions.

This paper is organised as follows. In section II we examine the theoretical basis of the various measures of relative disincentives that have been used by those trying to estimate the behavioural effects of UI in Canada. The most sophisticated of these are based upon a classical model of the labour market developed by Fortin (1984), and thus we examine this model and its subsequent development by Milbourne, Purvis and Scoones (1990) in some detail. In section III we extend this paradigm in order to develop a more complete measure of the effects of UI disincentives on labour market behaviour. Section IV details the empirical development of our index of UI disincentives. This requires a close scrutiny of the actual parameters of the UI system as they have evolved over time, as the correct empirical analogue of a particular theoretical quantity is not always obvious. There is also the issue of how to aggregate different indices that are appropriate for certain types of individuals into one overall measure. The task of section V is to actually use the index in practice. We apply the index to the Canadian UI system since 1946, and this is compared to our calculation of the disincentives of the American, French and

German UI systems using similar techniques. Finally, we apply the index to the proposed Employment Insurance program, in order to estimate the potential effects of the new system upon labour market disincentives in Canada.

II. The theoretical basis of existing measures of UI disincentives

Indices of UI generosity and disincentives have been used quite frequently in studies of the Canadian labour market: Table 1 below provides a by no means exhaustive list. What all these papers have in common is that they attempt to measure the behavioural effects of UI upon the aggregate unemployment rate, and use variations upon the simple neo-classical labour supply model to justify the indices that are used. In its simplest form, this paradigm assumes that agents make choices about their desired level of employment based upon a comparison of the wage whilst employed and the wage whilst unemployed. This last is equated to the level of unemployment benefits. Because in Canada this latter variable is a function of the agent's previous wage, the replacement rate is often used as the key indicator of UI disincentives. Often this variable is weighted by the degree of UI coverage, which gives a quantity which would be equal to the *expected* replacement ratio in a world of identical agents where eligibility was decided at random.

An important feature of the evolution of the Canadian UI system over the last 25 years has been the many changes in qualifying periods and maximum benefit durations. In order to capture these features several authors have weighted the replacement rate measure of UI disincentives by the ratio D/M, where M is the minimum qualifying weeks and D is the maximum duration of benefits when one has worked just M weeks. Often this is done in an ad hoc fashion, without any theoretical model to justify the particular functional form used. However the papers by Fortin (1989), Burns (1990), and Myatt (1992) do use a theory-based measure, the theoretical development of which is due to Fortin (1984). The derivation of this measure is discussed below.

1. Fortin's measure

Fortin (1984) derives theoretically an appropriate measure of UI disincentives. The framework that he uses is the neo-classical labour supply model, in which agents make decisions about the division of their time into employment and leisure in the context of a competitive labour market with no constraints and perfect information. The introduction of an unemployment insurance scheme which changes the relative prices of work and leisure will then inevitably lead to distortions. What makes Fortin's model a little different from the textbook labour supply model is that the agent chooses not only the duration of unemployment but also the frequency of spells. In a simple model this distinction would be irrelevant, but with a UI system that has a minimum qualifying period and a maximum benefit duration the division of a certain period into employment spells and non-employment spells is very significant.

In the model the UI regulations are stylised as follows. In order to qualify for UI, an agent must work at least M weeks. After a waiting period of A weeks, the agent is then entitled to receive benefits whilst unemployed for up to a maximum of D weeks. The benefit schedule is, therefore, a step function, increasing from zero to D at M weeks of employment, and constant thereafter. Benefit payments are equal to a ratio $\rho \in (0,1)$ of the previous wage w.

Table 1: Indices of UI disincentives/generosity.

Measure of disincentives/generosity		Author
Average Replacement Rate		Grubel, Maki and Sax (1975),
Average Replacement Rate × Coverage		Landon (1987), Keil and Symons (1990)
Ratio of Maximum Insurable Earnings to Average Wages × Coverage × Maximum Benefit Weeks for a Minimally Qualified Claimant. ÷ Minimum Weeks to Qualify		Rose (1988), Ford and Rose (1989), Coe (1989).
Ratio of Maximum Insurable Earnings to Average Wages × Coverage		Coe (1989).
Maximum Benefit Weeks for a Minimally Qualified Claimant		Milbourne, Purvis and Scoones (1991).
Average Replacement Rate × Coverage × Maximum Benefit Weeks for a Minimally Qualified Claimant ÷ Minimum Weeks to Qualify		Fortin (1989), Burns (1990), Myatt (1992), Bougrine and Seccareccia (1994).
Total UI Benefits ÷ Total Earnings		Moorthy (1989)

Given this system an agent in Fortin's model must choose a time horizon K, an unemployment rate u and a *compensated* unemployment rate v in order to maximise utility

$h = h(y,u)$, subject to

$y = w(1 - u + \rho v)$,

$v = \min(u\text{-}A/K,\ D/K)$ if $(1-u)K \geq M$ (Minimum Work Requirement)

and $uK \geq A$ (Waiting Period)

$= 0$ otherwise.

Thus over a period of time K, the individual spends $(1\text{-}u)K$ weeks employed and uK weeks unemployed, of which only vK weeks are actually compensated, given the existence of the maximum benefit duration D and the waiting period A.

The model is solved in two stages. In the first, one obtains the income maximising duration K^* as a function of the unemployment rate u. This yields the efficient income unemployment frontier y^*, on which agents locate given their preferences over income and leisure. This process is illustrated in figures 1 to 3. In the first diagram, the u–K space is divided into three regions, depending upon the rate of compensated unemployment v. The first region, $v = 0$, is bordered by the entrance requirement $vK \geq M$. For a given time horizon, if the time spent unemployed is high enough, the agent will not spend long enough employed to qualify. The second region, $v = u - A/K$, is bordered to the right by the line $uK = D$. This is the locus of points along which the time spent employed is just long enough to permit the rest of the time period to be spent receiving UI. For a given time horizon, if the unemployment rate is lower than this, the agents will not be collecting all the UI benefits to which they are entitled because they simply do not have enough time left. The left border of this region is the line $uK = A$. This represents the minimum unemployment consistent with receiving UI, given the waiting period A. The third region is that in which $v = D/K$: here the agent is claiming the maximum benefits possible.

The question now is to discover the optimal value of K for a given unemployment rate u. With this latter variable fixed the agent's welfare is increasing in v, and so one has

$$K^*(u) = \max\left\{\frac{A+D}{u}, \frac{M}{1-u}\right\}.$$

In figure 1 this solution is represented by the solid line. The critical level of unemployment u_c at which the agent works just long enough to qualify and at the same time receive maximum benefits is given by

$$u_c = \frac{A+D}{M+A+D}$$

At this point the time horizon K is equal to the sum of UI benefits and the minimum qualifying period of employment plus the waiting period, which is $M+A+D$. Note that one implication of the model is that agents will always exhaust their unemployment benefits before becoming re-employed. This is due to the existence of the waiting period A. To see

why this is so, imagine a worker who wishes to spend a certain proportion u of his time unemployed. Suppose further that $u < u_C$, so that the agent is not worried about the entrance requirement. It is clearly in the agent's interests to minimise the proportion of uncompensated unemployment in their total unemployment spell. For spells less than the maximum duration D, this uncompensated time is given by the waiting period A. In order to reduce the *proportion* of time spent waiting, the agent will increase their time horizon, thus having one long unemployment period and only one waiting period rather than several spells and several waiting periods. In the limit however, the time horizon will be so long that the length of the unemployment spell will be equal to the maximum benefit duration, and further increases in K will mean further uncompensated unemployment time.

The calculation of $K^*(u)$ is depicted in figure 1. The discontinuity in income at the point at which one becomes eligible for UI is immediately apparent. The figure also illustrates how income drops sharply for $K > K^*$ as the agents increase their uncompensated unemployment time. However, given the short waiting period for benefits, the decline in income for $K < K^*$ is less marked for those agents with $u < u_C$.

Given the optimal time horizon K^*, the optimal rate of compensated unemployment is

$$v^* = D / K^* = \min\left\{u\frac{D}{A+D},(1-u)\frac{D}{M}\right\}$$

The efficient income-unemployment frontier is therefore given by

$$y^* = w(1 - (1-\rho D/(A+D))u) \quad \text{for} \quad 0 \le u \le u_C$$

$$= w(1 + \rho D/M)(1-u) \quad \text{for} \quad u_C \le u \le 1.$$

This is illustrated in figure 3 above. The slope of the schedule is the marginal opportunity cost of unemployment, which is much higher above u_C because above this point additional unemployment will not be compensated by the UI system.

On the basis of this analysis, Fortin argues that indices of UI disincentives should use $\rho D/M$ rather than just ρ, at least for marginally attached workers. This is because for these individuals an extra week of employment not only reduces uncompensated unemployment time directly by substituting a paid week for an unpaid week, but it also allows them to substitute compensated unemployment time for uncompensated unemployment time by increasing their UI eligibility. For these workers UI acts as a subsidy to employment, whereas as for those with $u \ge u_C$ UI acts as a tax, because extra weeks of work mean lost UI benefits. Fortin's measure of disincentives is therefore the implicit subsidy rate $\rho D/M$, and it is this variable which has been used in empirical work by several authors.

Figure 1: Fortin Model (M=13, A=2, D=34)
Income Maximising Duration of Time Horizon.

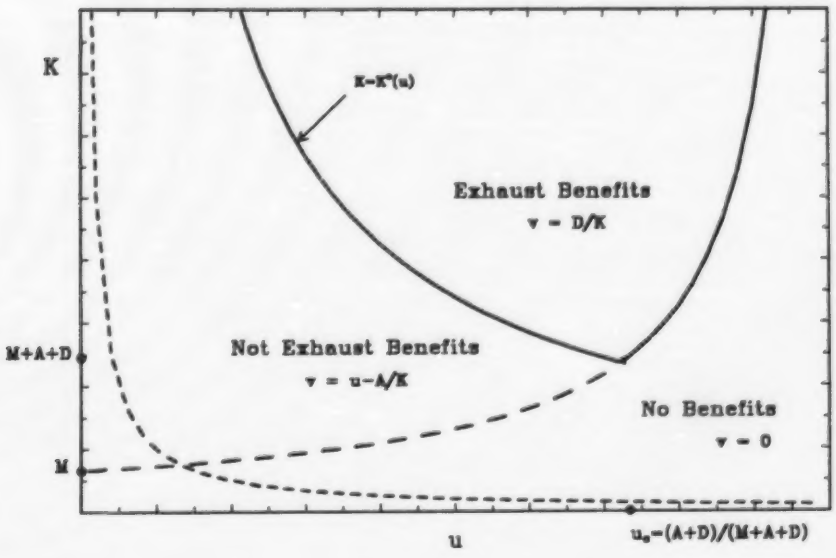


Figure 2: Fortin Model (M=13, A=2, D=34, ρ=0.72, W=10)
Income as a function of Unemployment (u) and the Time Horizon (K).

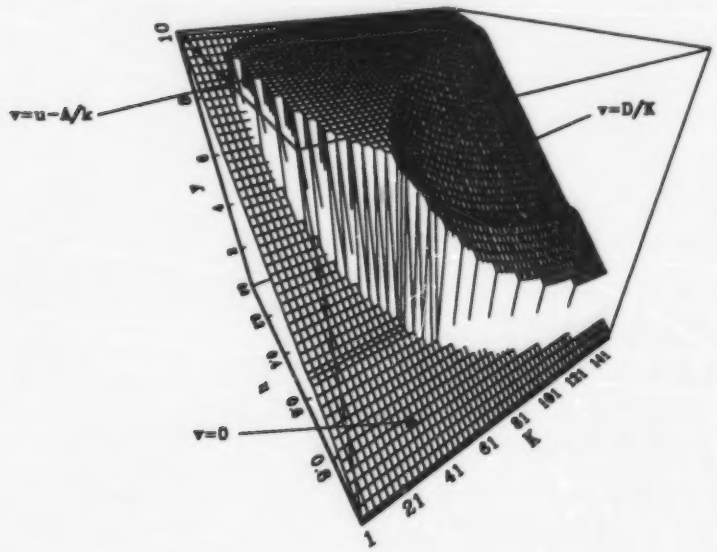
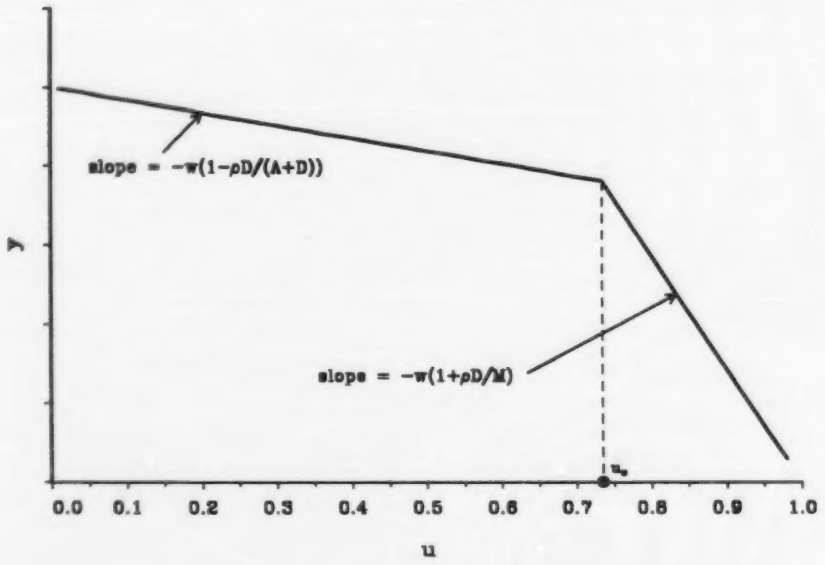


Figure 3: Fortin Model (M=13, A=2, D=34, ρ=0.72, W=10)

The Efficient Income-Unemployment Frontier.



A central problem with Fortin's measure is that it only captures the behaviour of those with unemployment rates between u_C and 1. For those with lower unemployment rates the relevant measure is $\rho D/(A+D)$. In addition, the kink point $u_C = (A+D)/(M+A+D)$ is also a function of the UI system, and therefore the relative proportions of agents for whom the two measures are relevant will also vary. These problems arise because Fortin's model is essentially a partial equilibrium model of the labour market, and does not give an expression for the *aggregate* unemployment rate.

Two further problems with Fortin's measure concern the assumed form of the benefit system. The parameter D is not only the minimum level of benefits obtainable, but also the maximum. In reality extra weeks of work yield extra weeks of benefit. The second problem is that from 1978 to 1990, claimants who had a history of UI receipt were required, in most places, to work extra weeks before qualifying for UI. This will change the ratio D/M.

2. Milbourne, Purvis and Scoones' measure

In their 1990 paper, Milbourne, Purvis and Scoones construct a general equilibrium model of unemployment based on a framework similar to Fortin's. Preferences in their model are given by

$$h_i = \alpha_i y_i + u_i \quad \text{where} \quad \alpha_i \sim F:[0,\overline{\alpha}] \rightarrow [0,1].$$

The parameter α_i measures the taste for leisure of the agent *i*. It is assumed that this parameter is distributed across the population according to the distribution $F(\alpha)$. It is this assumption which allows the authors to construct an expression for the aggregate unemployment rate. The other major difference is that utility is now assumed to be linear in income and leisure. This in turn implies that indifference curves will also be linear, which means that agents will generically be at a corner or at a kink point in the context of a diagram like figure 3. Without unemployment insurance the income–unemployment frontier is a straight line, and thus agents will either be employed for the whole time period ($u = 0$), or unemployed ($u = 1$). Which option an agent will choose will depend upon whether the marginal utility of work, αw, is greater than the marginal utility of leisure, which is equal to 1. Milbourne, Purvis and Scoones identify no employment at all ($u = 0$) with out of the labour force status, and therefore without UI there is no unemployment. The employment to population rate is simply the probability that $\alpha w > 1$, which is

$$1\text{-}F(1/w)$$

The UI system assumed in the paper is the same as that posited by Fortin, except that the waiting period A is set to zero. In this case the income-employment frontier is similar to that assumed by Fortin, with a kink point at $u_C = D/(D+M)$. Because of the linear preference assumption, agents will locate themselves at $u = 1$, $u = 0$, or the kink point u_C. Thus it is only those agents who are at u_C who are actually counted as unemployed. Note that, with more general preferences, as in Fortin's model, agents would distribute themselves also on the intervals $(0,u_C)$ and $(u_C,1)$. However, one would still expect to see large congregations of agents at this kink point.

The proportion of fully employed agents in the economy under UI will now be given by $1 - F(\alpha_2)$, where

$$\alpha_2 = \frac{1}{w(1-\rho)}.$$

What this implies is that flows from full employment to partial employment are governed by $w(1-\rho)$, the slope of the income-employment frontier at $u = 0$. The proportion of the population who choose never to be employed is defined as $F(\alpha_1)$, where

$$\alpha_1 = \frac{1}{w(1+\rho \cdot D/M)}$$

In this case the flows between the two states of out of the labour force and partial employment is governed by the slope of the income employment frontier at $u = 1$. The unemployment rate is then

$$u^* = \frac{\frac{D}{D+M}[F(\alpha_2) - F(\alpha_1)]}{1 - F(\alpha_1)}$$

$$= f(\overset{+}{D/M}, \overset{+}{w(1+\rho D/M)}, \overset{-}{w(1-\rho)})$$

The numerator of the first expression is the unemployment to population ratio, and the the denominator is the participation rate. An increase in the minimum benefit weeks M will reduce unemployment to population ratio by increasing the weeks worked by the partially unemployed (through the reduction in $D/(D+M)$), and by making some agents leave the labour force (through the increase in α_1). This latter effect will however reduce the participation rate. Turning to the second equation, one can see that the aggregate unemployment rate u^* is determined by three variables: the wage, the replacement rate and the ratio D/M.

In their empirical work, Milbourne, Purvis and Scoones use D rather than D/M. Indeed they state that "there is no theoretical justification for entering these variables as a ratio" (p. 824). This statement is puzzling because the reverse would appear to be correct: it is the ratio D/M that enters u^*, not D alone.

There are several points to note about the expression for the aggregate unemployment rate derived above. First, the exact functional form will depend upon the functional form assumed for the distribution of preferences. Second, the measure is still partial equilibrium because it depends upon the level of wages. Thirdly the assumed UI system does not allow for the waiting period, the provisions regarding repeat users, and the fact that additional weeks of work yield extra weeks of benefit. In the next section we shall attempt to modify their measure to deal with these problems.

III. Theoretical development of an index of UI disincentives

In the previous chapter we presented a brief outline of two models of UI induced unemployment. In this chapter we will adapt these models to better reflect the Canadian UI system, and also to deal with the question of aggregation.

1. An extended version of the classical model

An important criticism of both the models presented in the previous chapter is that they both assume that the maximum weeks of benefits (D) available to someone who worked only the minimum number of weeks M is the same as that available to someone who has worked more than M weeks. In fact additional weeks of employment yield additional weeks of benefit entitlement. Thus the benefit schedule is not a step function, but instead is upwards-sloping. In this subsection we shall attempt to rectify this omission by introducing a more realistic model of Canada's UI system.

As before we shall define M as the minimum weeks of employment required to qualify for UI, and D as the number of weeks of UI that a person would be entitled to after working M weeks. After this point additional weeks of work yield additional weeks of UI benefit entitlement, up to a maximum number of weeks of benefit Z. The number of weeks required to obtain Z weeks of UI is defined as X. This benefit schedule is pictured in figure 4. The slope of this schedule is given by

$$\beta = \frac{X - D}{Z - M}.$$

There are now three rather than two relevant regions. The first is the area where the agent does not qualify for benefit, the second is where the agent gets some benefit but not the maximum, and third is where the agent gets the maximum benefit duration Z. The unemployment rates at the boundaries between these regions are as follows. For the boundary at the point where the agent is just eligible for benefits one has

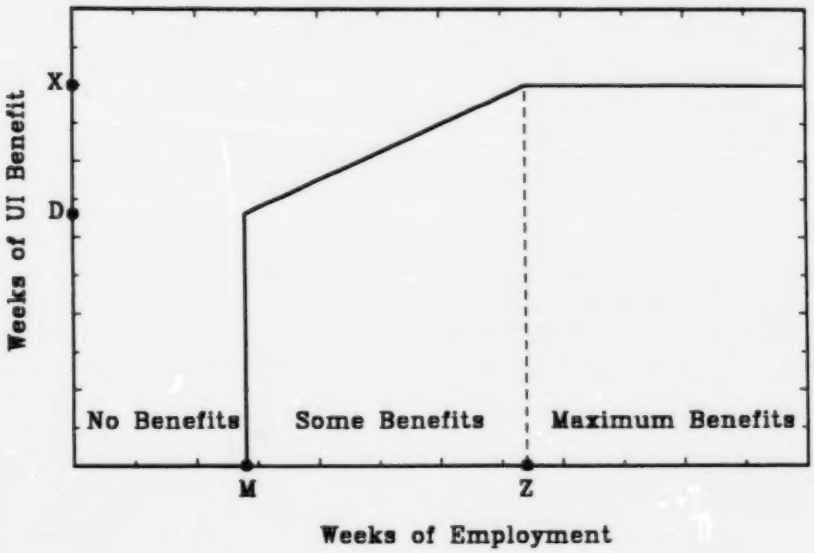
$$u_{\min} = \frac{A + D}{A + D + M}$$

and at the point where the agent is just eligible for maximum benefits one has

$$u_{\max} = \frac{A + X}{A + X + Z}.$$

The locus of optimal unemployment rate and time horizon combinations is illustrated in figure 5. As before, for unemployment rates higher than $u_{\min}$, the locus is the sequence of points where the agent is just eligible for UI, whereas for $u < u_{\min}$, the locus consists of those values which ensure that agents use up all their benefits, but become employed again immediately afterwards.

Figure 4: Extended Classical Model: Benefit Schedule.



The optimal income-unemployment frontier is illustrated in figure 6. There is now a kink point at u_{max} as well as at u_{min}, however the empirical significance of this point is likely to be slight. This is because as the waiting period $A \rightarrow 0$, the slope of the two sections either side of the kink point at u_{max} become the same: $-w(1-\rho)$. This is the same value as the relevant slope of the income-unemployment frontier in Fortin's model when $A = 0$. Note that for $u \geq u_{min}$, the frontier is identical to Fortin's model, with $u_C = u_{min}$.

Thus with a short waiting period the extended model produces very similar results to that of Fortin's model. The reason for this is as follows. Firstly for those agents with a high taste for leisure the fact that extra weeks of work above M entitle them to extra UI benefit is irrelevant because once all their unemployed time is financed by UI ($K = M + A + D$) the marginal benefit of extra weeks of work must fall. Thus a kink point is inevitable at u_{min}, and for agents who are on or above this point the shape of the rest of the schedule is irrelevant. To reiterate, the behaviour of the benefit schedule after M weeks does not affect the location of the kink point where UI ceases to be a subsidy to agents to turn uncompensated time into compensated time. For agents with greater attachment to the labour market, the benefit of longer entitlement periods is that it allows the waiting period to be amortised over a longer spell of employment. However with a small waiting period this gain from extra weeks of work is slight. The most important factor in these agents' behaviour will be the replacement rate ρ.

Figure 5: Extended Classical Model (M=14, D=33, Z=37, X=50)
Income Maximising Duration of Time Horizon.

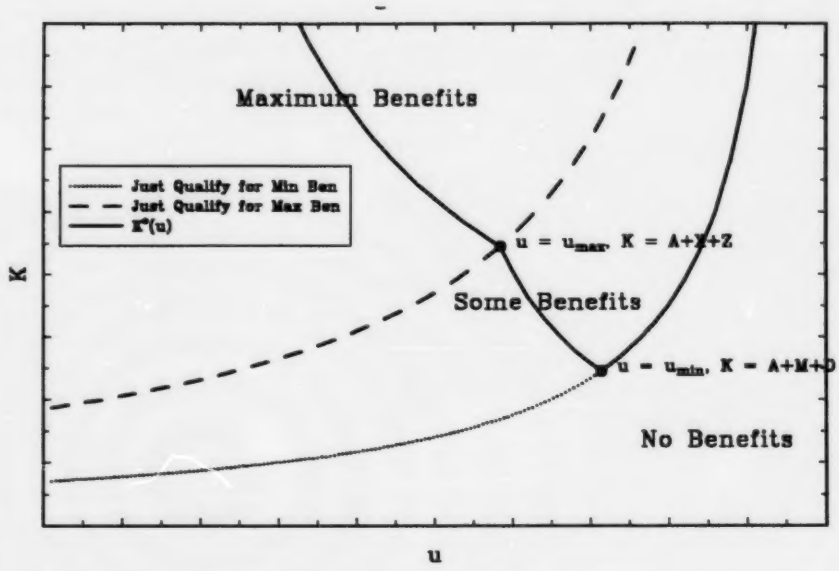
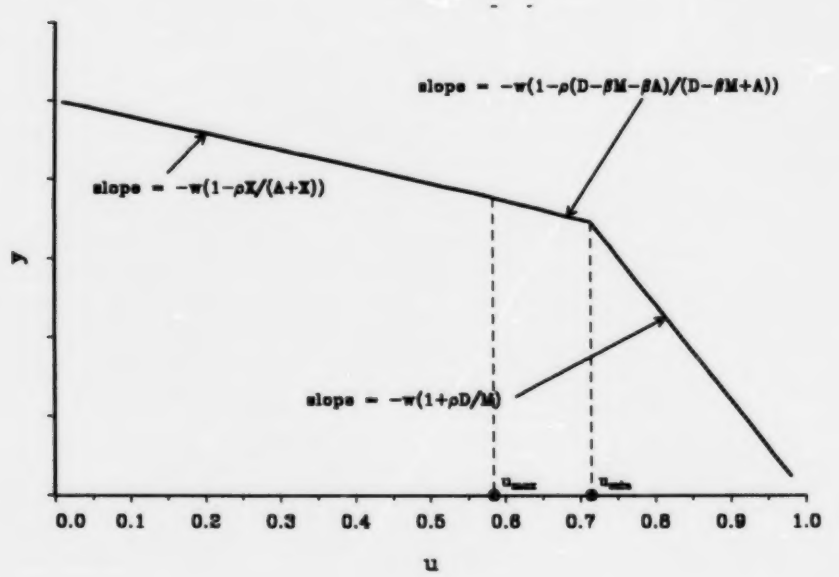


Figure 6: Extended Classical Model (M=14, D=33, Z=37, X=50)
The Efficient Income-Unemployment Frontier.



2. Fixed time horizons in the classical model

An objection to using $\rho D/M$ as an indicator of UI disincentives is that it ignores the fact that D is a function of M. Suppose the system is such that for H weeks of work one receives βH weeks of benefits, given that H is at least equal to the minimum qualifying level of M_1 weeks. In this case one has $D_1 = \beta M_1$ weeks, and so $D_1/M_1 = \beta$. Assume that the entrance requirement is raised to M_2 weeks. The weight D_2/M_2 is still equal to β! Yet one would assume that an increase in the minimum entrance requirement would result in an unambiguous decrease in the disincentives of the program. This criticism also applies to the extended model, albeit in a less attenuated form. In this case the benefits D are given by $\alpha + \beta M$, implying that

$$D/M_1 = \alpha/M_1 + \beta > \alpha/M_2 + \beta = D/M_2.$$

The reason why the measures of UI disincentives from Fortin's model are so insensitive to changes in M is the assumption of a freely varying time horizon. Suppose $M = 10$. Then agents who like to spend half of their time unemployed will work ten weeks and receive ten weeks of UI, implying a time horizon of twenty weeks, (assuming $A = 0$ for simplicity). If M is raised to twenty, this behaviour will no longer be possible. However all one has to do in order to maintain the same unemployment rate and income is to work for twenty weeks and then claim UI for twenty weeks. Thus as long as M is not so high as to push the agent against the maximum benefit constraint X, changes in M have no effect on the index of disincentives.

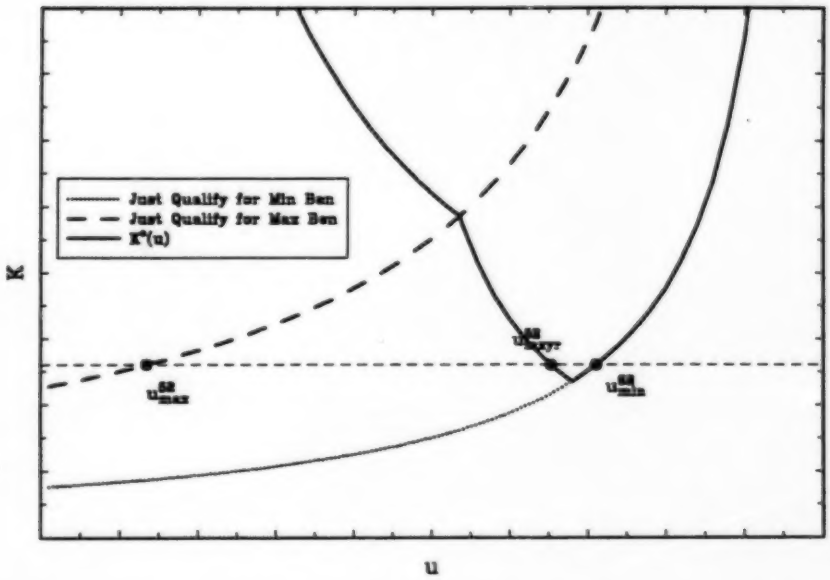
There is though an important group of workers for whom this form of adaptive behaviour is not easy: seasonal workers. Typically such persons will be constrained into a time horizon of one year. This does not necessarily mean that they have no control over the length of their job, but it does place constraints on the frequency and timing of their job spells.

In this subsection we shall use the extended classical model above to examine agents' behaviour under the assumption that the time horizon is fixed at 52 weeks. This is tantamount to assuming that all jobs must begin at the same time each year. In the flexible time horizon model, the agent's efficient income-employment frontier was kinked at two points: u_{min}, which is the highest value of u consistent with claiming UI for the whole period of unemployment (less the waiting period); and u_{max}, which is the rate of unemployment at which the agent is just eligible for maximum benefits. Note that for all $u \geq u_{min}$, the agent's uncompensated unemployment time is limited to the irreducible minimum of the waiting period. Further, when choosing K optimally, agents will always claim UI for as long as their entitlement. However with a fixed time horizon, agents no longer have the freedom to change K in order to ensure the minimum uncompensated unemployment possible, and that all benefits are exhausted.

The implications of this are illustrated in figure 7. The highest rate of unemployment consistent with still qualifying for UI is now given by

$$u^{52}_{min} = 1 - M/K = 1 - M/52.$$

Figure 7: Classical Model with fixed Time Horizon of 52 Weeks.



The highest rate of unemployment at which one is still eligible for maximum benefits is

$$u^{52}{}_{max} = 1 - Z/K = 1 - Z/52.$$

However, as figure 7 makes clear, neither of these unemployment rates is consistent with the locus of points $K^*(u)$ which gives the optimal behaviour when K is unconstrained. If the unemployment rate is chosen as $u^{52}{}_{min}$, then the agent will have uncompensated unemployment time over and above the waiting period A. If u is equal to $u^{52}{}_{max}$, so that the agent is eligible for maximum benefits, agents would not exhaust their benefits before it became time to resume their jobs. Indeed there is now just one rate of unemployment consistent with exhausting one's benefits but still having the minimum of time without UI. This rate is given by

$$u^{52}_{mxyr} = \frac{1}{1+\beta} \cdot \frac{A + D + \beta(52 - M)}{52},$$

where β is the slope of the benefit schedule. Note that under Canada's UI system it has always been the case that

$$u^{52}{}_{mxyr} \in [u^{52}{}_{min}, u^{52}{}_{max}].$$

The income-employment frontiers for the constrained and unconstrained cases are given in figure 8. For high unemployment rates this frontier has a slope of one in the constrained case, because for $u > u^{52}{}_{min}$ the agent is no longer eligible for UI. Note that with linear utility (as in Milbourne, Purvis and Scoones), the agent will never choose to be in this region.

To obtain an expression for the aggregate unemployment rate we shall assume linear utility. Under this assumption agents will congregate at four points on the frontier: $u = 0$, $u = u_{mxyr}$, $u = u_{min}$[52], and $u = 1$.

Following Milbourne, Purvis and Scoones' notation, let α_1 be the lowest value of the marginal utility of income parameter α consistent with being in the labour force, and let α_2 be the highest value consistent with some unemployment. In addition, let α_{mxyr} be the lowest value of marginal utility of income consistent with choosing an unemployment rate of u_{mxyr}. The aggregate unemployment rate is then given by

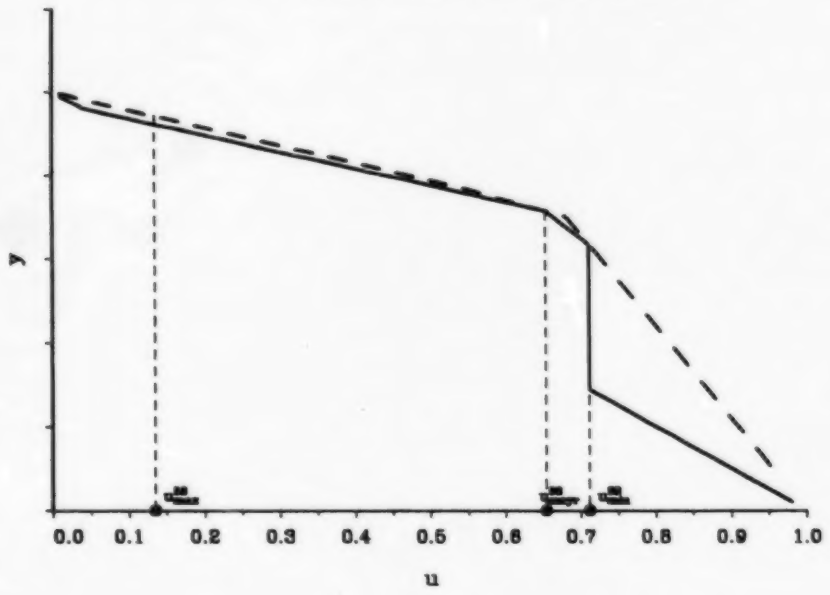
$$u^{52} = \frac{\left[F(\alpha_{mxyr}) - F(\alpha_1)\right] \cdot u_{\min} + \left[F(\alpha_2) - F(\alpha_{mxyr})\right] \cdot u_{mxyr}}{1 - F(\alpha_1)}$$

where the first term in the numerator is the proportion of the population at u_{min}, multiplied by their unemployment, and the second term is the proportion of the population at u_{mxyr}, again multiplied by the unemployment of these agents. This equation can be rewritten as

$$\begin{aligned} u^{52} &= f\left(u_{min}, u_{mxyr}, \alpha_1, \alpha_{mxyr}, \alpha_2\right) \\ &= f\left(1 - M/52, 1 - MXYR/52, w(1+\rho D/M), w(1+\rho), w(1-\rho)\right) \end{aligned}$$

Recall that the unemployment rate in Milbourne, Purvis and Scoones was given by

Figure 8: The Income–Unemployment Frontier with a Fixed Time Horizon of 52 Weeks



$$u^{*} = f(u, \alpha_1, \alpha_2)$$
$$= f(D/M, w(1+\rho D/M), w(1-\rho)).$$

Thus in the constrained case the minimum weeks of work required in order to claim UI does enter separately into the equation in its own right, as well as a part of the ratio *D/M*. One also has the variable *MXYR*, which is the minimum number of weeks of work required to spend the rest of the year on UI. However, note that the two unemployment rate equations assume the same rate of labour force participation (1-F(α_1)), and the same rate of full employment F(α_2). What changes is that there are now two different unemployment durations rather than one.

3. Allowing for more general preferences

In order to construct our index we must specify the preferences of an individual agent. The specification of Milbourne, Purvis and Scoones is attractive because it leads to linear indifference curves in the space in which the income–unemployment frontier is drawn. This means that agents will almost always congregate around the kink points in the frontier, implying a discrete number of possible unemployment durations. This simplifies the construction of the index. However, the specification also has, what some would argue, an undesirable feature: it implies that rising real wages will ultimately push the participation rate to one. This is evident from the condition for a marginal worker to be participating in the labour force, which if we abstract from the UI system is

$$\alpha_i \geq \frac{1}{w}.$$

Because α is fixed and positive, increases in real wages will ultimately ensure that this holds for all agents. Further, UI induced unemployment will ultimately disappear for similar reasons: ultimately the value of working full-year will be greater than working part-year, because wages will ultimately dominate the value of leisure. In order to avoid this state of affairs it is necessary to make the value of leisure proportional to wages. Pissarides (1990) argues that there are plausible reasons why this might be so. For example, income from pensions or other family members, the level of which will influence participation, will typically be related to the general level of wages.

To allow for this argument, we generalise Milbourne, Purvis and Scoones' utility function as follows:

$$h_i = \frac{\alpha_i}{w^{\beta}} y_i + u_i, \quad \beta \in [0,1].$$

When $\beta = 0$, this specification is the same as Milbourne, Purvis and Scoones'. When $\beta = 1$, the specification has the property that the value of leisure (w^{β} / α_i) grows at the same rate as income. This utility function gives linear indifference curves in income weighted by w^{β} and unemployment space. This means that the diagrams of the efficient income–unemployment frontier above are valid if the y-axis is relabelled y/w^{β}. Thus agents will still

congregate around the kink-points. The value of α at which an agent is indifferent between participation and being out of the labour force, α_1, is now

$$\alpha_1 = \frac{1}{w^{\beta}\left(1+\rho\frac{D}{M}\right)},$$

and the value of α consistent with being indifferent between working all-year and working part-year is

$$\alpha_2 = \frac{1}{w^{\beta}\left(1-\rho\frac{D}{A+D}\right)}$$

The relevant expressions for seasonal workers, constructed in the previous section, need to be similarly modified.

4. Aggregation

In this chapter and that preceding it we have examined a number of different parameters of the UI system that contribute to explaining the level of UI induced unemployment. With sufficient degrees of freedom one could include all these variables in a reduced form equation to explain unemployment. However in practice, degrees of freedom are limited and what is required is a single measure of the effect of UI on unemployment. In order to produce such a measure it is necessary to make some assumptions about the distribution of the taste parameter α. There are of course many possible candidates for such a distribution. One particularly appealing choice is the Pareto distribution, which is defined as

$$P(x) = 1-\left(\frac{x_0}{x}\right)^{\theta}, \qquad x > x_0, \;\; \theta > 0.$$

This distribution has the advantage of possesing a tractable closed form, unlike the Normal distribution, for example. It is often used in studies of income distribution. Another advantage of this particular distribution will soon become apparent.

From our discussion of Milbourne, Purvis and Scoones' model, the unemployment rate is given by

$$u^{*} = \frac{D}{D+M}\cdot\frac{F(\alpha_2)-F(\alpha_1)}{1-F(\alpha_1)}$$

Substituting the formula for the Pareto distribution into the expression for the unemployment rate, one has

$$u^{*} = \frac{D}{D+M}\left[1-\left(\frac{\alpha_1}{\alpha_2}\right)^{\theta}\right]$$
$$= \frac{D}{D+M}\left[1-\left(\frac{1-\rho D/(A+D)}{1+\rho D/M}\right)^{\theta}\right].$$

Note that this expression is not only independent of the location parameter x_0, but is also independent of the wage w, no matter what the value of β. This latter feature may seem arbitrary, but is in fact a desirable property, for were it not to be the case, then UI-induced unemployment would rise or fall indefinitely with the upward trend in the real wage. From a practical perspective, it seems undesirable to have our index of disincentives increase over time simply because real wages are increasing, without changes in the structure of the UI system.

The equivalent expression for UI-induced unemployment for seasonal workers is

$$u^{52} = u_{\min}\left[1-\left(\frac{\alpha_1}{\alpha_{mxyr}}\right)^{\theta}\right] + u_{mxyr}\left[\left(\frac{\alpha_1}{\alpha_{mxyr}}\right)^{\theta} - \left(\frac{\alpha_1}{\alpha_2}\right)^{\theta}\right]$$
$$= \left(1-\frac{M}{52}\right)\left[1-\left(\frac{1+\rho}{1+\rho D/M}\right)^{\theta}\right] + \left(1-\frac{MXYR}{52}\right)\left[\left(\frac{1+\rho}{1+\rho D/M}\right)^{\theta} - \left(\frac{1-\rho}{1+\rho D/M}\right)^{\theta}\right].$$

which is again independent of the wage rate.

5. Conclusions

Our measure of UI-induced unemployment makes a number of strong assumptions in order to produce a tractable measure. One assumption is that extra weeks of work do not yield extra benefits: however, we have shown above that allowing for this does not change the measure materially. Assuming a 52 week time horizon does, however, and we have developed an index that assumes this restriction. Ideally one would wish to combine this with the flexible time horizon measure: however, this is somewhat difficult because it is not clear what the right weights are. One obvious candidate, the proportion of workers in seasonal industries, is not appropriate because it might well be endogenously determined by the disincentives of the UI system if this system subsidises seasonal work. Ideally one would have to model the decision to enter seasonal as opposed to non-seasonal work.

There are a number of other factors that we have not considered. One is the phenomenon of working on claim. A worker who is claiming UI, and who then takes a job for a few weeks and then quits does not need to make a new claim but can continue to claim benefits established under the original claim. In this way a worker avoids the waiting period, the regulations regarding repeat users and the regulations regarding those who quit. In the models we have been considering this behaviour does not occur: a worker is assumed to establish a new claim each period. This is because in the classical model it is never optimal behaviour to work on claim: this is because one is using up precious weeks of benefits. Given that in the classical model one has complete flexibility to choose when

to work and when to stop, it is always better to work when ones benefit period has expired. We suspect that a proper examination of this issue requires a search framework incorporating temporary layoffs. Our conjecture is that people who engage in this practice are fairly attached to the labour force, and are therefore relatively insensitive to changes in benefit week regulations anyway: for these people the classical model predicts that the incidence of unemployment is governed by α_2, which is a function of the level of benefits only.

Another aspect of the benefit regulations that we have not considered is the position of quitters: we are implicitly assuming that due to the absence of experience rating the employees will be able to induce their firm to lay them off at no cost, enabling these individuals to qualify for UI.

In the next section we will look at the empirical implementation of the measure of UI disincentives that we have proposed. In the process we will conduct a close empirical analysis of the different parameters that go to make an index of UI disincentives.

IV. Empirical development of an index of UI disincentives

In the previous two sections we have examined unemployment insurance disincentives from a largely theoretical perspective. In this section we shall begin our empirical investigations. We will examine in detail the three major sets of parameters in any UI program: coverage and eligibility; benefit levels; and entrance requirements and benefit duration. In each case we shall present the different measures available, illustrate their time series behaviour, and indicate which is the appropriate measure for inclusion in our indices of unemployment insurance disincentives. The section concludes by examining the empirical implementation of the aggregate indices developed in section III.[3]

1. Coverage and eligibility

In describing the UI program it is important to distinguish between coverage and eligibility. Since 1971 UI coverage has been virtually universal at around 90% of the employed labour force (see figure 9). The main exceptions are the self-employed and those part-time workers earning less than one-fifth of maximum insurable earnings and working less than 15 hours a week. Persons over 65 are also excluded: this cut-off age was lowered from 70 in 1976. Retired workers used to be able to claim a payment upon reaching the cut-off age, but this was abolished in 1990.

Although *coverage* is universal, in the sense that all full time employees must pay into the fund, a worker is not necessary *eligible* for benefits after separating from a job and entering unemployment. This is true even if he or she has worked the necessary number of weeks to qualify. Under the original 1940 Act those who left employment without just cause, refused to accept suitable employment, or who were dismissed for just cause had their benefit periods postponed for up to six weeks. Under the 1971 Act the penalty was changed to loss of benefits for up to three weeks, later increased to maximum of six weeks in 1977. The 1990 amendments increased this disqualification period to between seven and twelve weeks, and provided for a lower benefit rate of 50% of weekly insurable earnings. Finally, in 1993, those who quit without just cause or who were dismissed for cause were made completely ineligible for benefits.

Ideally one would like to include the effect of these administrative changes in any index of UI disincentives. Unfortunately, while information on the number of disqualifications is available, we do not have any information upon the average disqualification period. We do not consider that this omission is too important. Under the current non experience-rated system, firms have no incentive not to relabel quits as layoffs so their workers can receive UI (see Kuhn and Sweetman 1994).

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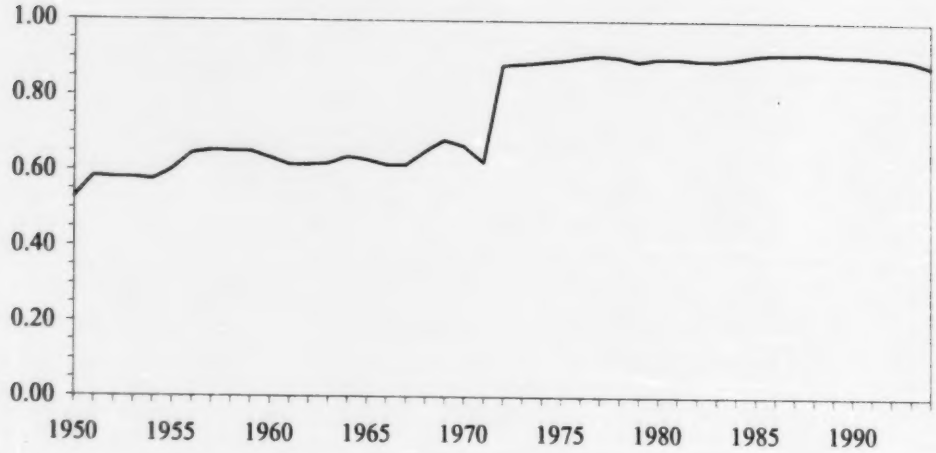
[3] For a more detailed description of the history of the UI scheme see Statistics Canada (1994) or Green and Riddell (1993). In appendix A we provide a chronology of the program since its inception.

Figure 9: Proportion of the employed covered by UI



As figure 9 demonstrates, the 1971 reforms increased coverage markedly, from 62% to 88% of total employment: a 33% increase. However, the proportion of the unemployed receiving benefits rose from 74% to 86%, only a 16% increase. And this does not take into account the fact that benefit duration entitlement also rose significantly after 1971. This discrepancy makes us suspicious of the current methodology of simply multiplying the coverage rate by the replacement rate to get an 'expected' replacement rate. This procedure would be appropriate if those to whom coverage was extended did not differ in their propensity to use the UI system: however this does not seem to be the case. Those to whom coverage was extended in 1972 were primarily teachers, civil servants, members of the armed forces, and those with salaries of over $7,800 per annum. These are workers for whom the rate of unemployment is particularly low, and therefore one would not expect the addition of these workers to increase pro rata the total quantity of benefits paid out. Indeed it may be more accurate to exclude coverage altogether from indices of UI eligibility, given that the 1971 extension of coverage was the most significant change in coverage since at least 1950. This is the approach that we will follow.

2. Benefit levels

In table 2 we present some information on the replacement rate, which is the ratio of weekly benefits to weekly earnings. The greatest changes took place in 1971, when there was a large increase in both the statutory replacement rate and the maximum insurable earnings threshold. It is important to note however that the 1971 reforms also made UI income taxable, and so changes in the statutory rate are an overestimate of the actual changes faced by a person . Since 1971 the statutory rate has declined somewhat, but this has not been accompanied by a long term decline in the average earnings replacement rate. This could be due to composition effects, because if those claiming UI are earning

relatively more than before, then this will tend to increase the average rate. Another possible explanation is the increase in maximum insurable earnings. As table 2 shows, the ratio between this variable and weekly wages has grown markedly since 1981, with the effect of allowing those relatively high up in the wage distribution to claim higher benefits than before. This will then have the effect of increasing the average replacement rate.

As we saw in section II, some authors use the average replacement rate instead of the statutory rate in their indices of UI disincentives. This allows for the effect of increasing maximum insurable earnings upon the replacement rate, but creates new problems. The problem with this approach is that dividing average benefits by average weekly earnings does not give the correct level of the replacement rate simply because the average unemployed person earns somewhat less than the average. Thus, as one can see from table 2, the average earnings replacement rate is an underestimate of the replacement ratio. There are also econometric problems, which stem from the fact that the average replacement rate is an ex post rather than an ex ante measure of disincentives: it incorporates information about not only the policy parameter but also agents' responses to this and other parameters, as well as composition effects. As an example of the latter consider the effect of the business cycle. Suppose that during recessions many high wage workers who would not normally be laid off are made unemployed and claim UI. This will have the effect of raising average benefits, pushing the average earnings replacement rate up and so making this variable counter-cyclical. This might lead one to conclude that the increase in unemployment during a recession was due to the UI system when, in fact the correlation was due entirely to composition effects.

It is therefore necessary to construct an ex ante measure of the replacement rate that incorporates the maximum insurable earnings limit. Let the statutory replacement rate be ρ, and the maximum insurable earnings level be denoted by w^*. Then for a given wage distribution $F(w)$, the average replacement rate for the economy is

$$\hat{\rho} = \int_0^{w^*} \rho dF(w) + \int_{w^*}^{\infty} \frac{\rho w^*}{w} dF(w)$$

$$= \rho F(w^*) + \int_{w^*}^{\infty} \frac{\rho w^*}{w} dF(w).$$

Note that one already needs to make distributional assumptions to construct a statutory replacement rate parameter, because for many periods there have been different replacement rates for those with and without dependants[4]. One also needs to make an assumption about the average income of a UI recipient in order to calculate the net replacement rate before 1971, given the progressivity of the tax schedule. However, in the present case we not only need to know the distribution at a point, but rather the whole shape of the distribution.

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[4] Corak (1992) uses U.I. administrative data to examine spells of U.I. receipt over the period 1971-1990. He finds that about 31% of these spells were for persons with dependants. We use this estimate in order to weight the different replacement ratios so that an aggregate index may be constructed.

Table 2: Replacement Rates under the Canadian UI Program 1968-94.

	Statutory Replacement Rate (Net)		Average Weekly Earnings	Weekly Benefit		Average Earnings Replacement Rate (Net)	Maximum Insurable/ Average Earnings
	Without Dependents	With Dependents		Maximum	Average		
1968	0.51	0.66	101	53	27	0.33	0.99
1969	0.51	0.66	108	53	32	0.36	0.93
1970	0.51	0.66	117	53	35	0.38	0.86
1971	0.51	0.66	127	53	39	0.39	0.79
1972	0.67	0.75	137	100	62	0.45	1.09
1973	0.67	0.75	148	107	68	0.46	1.08
1974	0.67	0.75	164	113	75	0.46	1.04
1975	0.67	0.75	187	123	85	0.45	0.99
1976	0.67	0.67	210	133	93	0.44	0.95
1977	0.67	0.67	230	147	101	0.44	0.96
1978	0.67	0.67	244	160	109	0.45	0.98
1979	0.60	0.60	265	159	108	0.41	1.00
1980	0.60	0.60	292	174	120	0.41	0.99
1981	0.60	0.60	327	189	129	0.39	0.96
1982	0.60	0.60	359	210	144	0.40	0.97
1983	0.60	0.60	382	231	154	0.40	1.00
1984	0.60	0.60	398	255	160	0.40	1.06
1985	0.60	0.60	412	276	169	0.41	1.11
1986	0.60	0.60	424	297	179	0.42	1.16
1987	0.60	0.60	440	318	187	0.43	1.20
1988	0.60	0.60	460	339	199	0.43	1.22
1989	0.60	0.60	483	363	212	0.44	1.24
1990	0.60	0.60	505	384	230	0.46	1.26
1991	0.60	0.60	529	408	244	0.46	1.28
1992	0.60	0.60	547	426	253	0.46	1.29
1993	0.57	0.57	556	425	256	0.46	1.34
1994	0.55	0.60	567	445	254	0.45	1.38

Source: Statistics Canada - cat. no. 73-202S

Note that in making these assumptions our preference is for fixed weight measures: i.e. to assume that the distribution is constant over the period of analysis. The advantage of this is that changes in the index will then be due only to legislative changes, not composition effects, which is desirable if the index is used for policy analysis.

If we had access to individual wage data for all of the last fifty years we could use this information to calculate the actual wage distribution and then use this to calculate the

average replacement rate. Unfortunately this information is not available. What we do have is the Labour Market Activity Survey, which covers the period 1986-90. In figure 10 we graph the empirical density of the wage function. Note that those jobs of fewer than 15 hours a week have been excluded, because they would not be eligible for UI. The 131,420 jobs remaining have been weighted by their durations so that the density is for full-year equivalent jobs. Thus an employment which lasted only 26 weeks counts as half a full-year equivalent job, whereas a job lasting for two years counts as two full-year equivalent jobs. For analytical convenience we approximate the empirical distribution by the Gamma distribution, the density of which is given by

$$g_{p,\lambda}(w) = \frac{\lambda^p w^{p-1} e^{-\lambda w}}{\Gamma(p)}, \qquad p > 0.$$

$$\text{where} \quad E(w) = \frac{p}{\lambda} \text{ and } V(w) = \frac{p}{\lambda^2}.$$

We use the calculated mean and variance from the empirical density to prove estimates of the theoretical parameters. This gives a distribution function that can be extrapolated back using average wages from table 2. For each year we scale the wage to the level of the empirical distribution, and then use this scaling factor to scale the maximum insurable earnings variable also. This enables us to use the equation on the previous page to calculate the expected value of ρ using standard numerical integration techniques. The basic identifying assumption is that the distribution has been stable around the mean over the whole period. Thus for example the proportion of jobs with wages at 1.5 times the average is assumed to be constant over the whole period. Consequently our calculated value of ρ will only change if there is a change in the statutory replacement rate or if the ratio of maximum insurable earnings to average earnings changes.

This calculated value is plotted in figure 11, along with other measures of the replacement rate. There is quite a close correspondence between the time series behaviour of our measure and the ratio of average UI benefit to average earnings, although the means of the two series differ. We would not expect these measures to be identical, because our value is the *expected* replacement rate for a worker *if* they claimed UI, whereas the other variable is an ex post measure that gives the actual replacement rate. This latter variable is lower because those claiming UI came from lower down the wage distribution than the average. This is exactly what one would expect, given that the replacement rate will be higher for these people.

One benefit rate parameter that we have not taken account of is the income-tax claw-back provision instituted in 1979. Under this regulation those claimants whose income (including UI) exceeds a certain threshold have to pay back up to 30% of their benefits. The effect of omitting this factor is likely to be small however: Kesselman (1983) estimated the total revenue collected to be between 0.5% and 0.8% of total program costs.

Figure 10: Density of the Wage Distribution 1986–90.

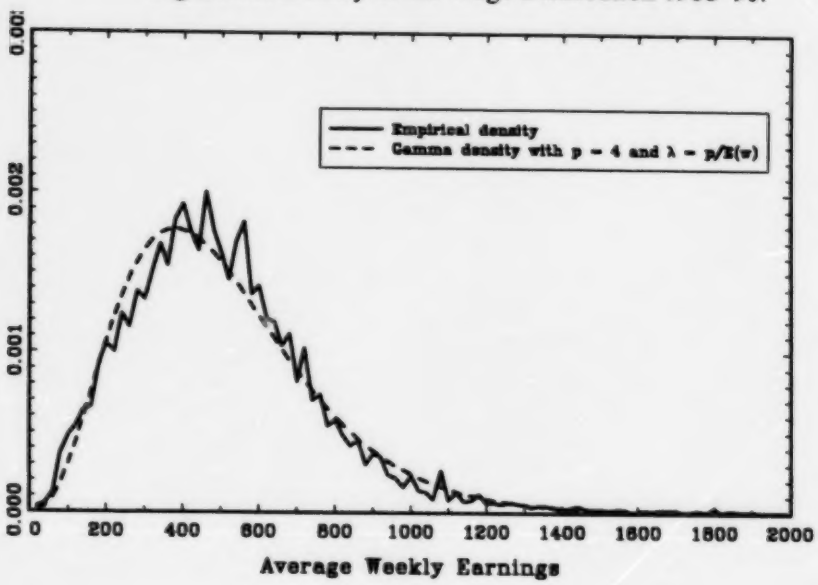
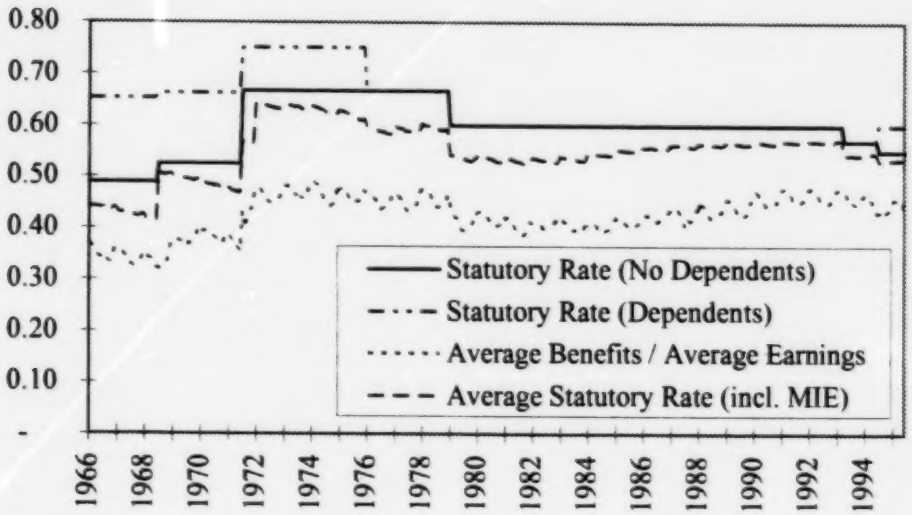


Figure 11: Replacement Rates 1966–94



3. Qualifying weeks and benefit duration

Perhaps the most complicated feature of Canada's unemployment insurance system is the relation between weeks of insured employment and weeks of benefit. Not only do benefit weeks vary with weeks worked (often in a non-linear manner), but benefits also depend upon the unemployment in the claimant's region of the country. Between 1971 and 1977 benefit weeks also depended on the difference between the regional and national rates of unemployment. Also the regional boundaries have been changed twice, once in 1978 and then in 1990. In table 3 and figures 12 and 13 below we present information upon these changes.

An important variable in our theoretical analyses was the minimum number of weeks worked to qualify a claimant for UI (*M*). Since 1977 this variable has been dependent upon the unemployment rate in the claimant's region. As figure 12 illustrates, *M* has steadily been increasing since the 1971 reforms, and is now 15 weeks since the previous claim for someone in a region with 10%–11% unemployment. This is greater than it was before 1971, when only 8 weeks of work since the previous claim was required to qualify for UI. (See appendix A for a more detailed description of the pre-1971 UI system). Note however that there is not too much difference between the minimum number of weeks required in 1990, and the minimum number in 1994.

An important feature of the 1977 UI program that has been entirely ignored by previous authors is the repeat use regulations, introduced in July 1979 and superseded in November 1990. These provisions required up to six extra qualifying weeks for claimants with some UI use in the previous 52 weeks, if the local unemployment rate was less than 11.5%. This is reflected in figure 12, where there is a large increase in *M* at this point.

Another variable of interest is the number of weeks a claimant must work in order to receive UI for the rest of the year (*MXYR*). Thus for an entire 52 week period a person is either employed, sitting out the 2 week waiting period for UI, or collecting benefits. This variable is of most relevance to those in seasonal industries who can expect to begin a perennial job at the same week in each year. As figure 12 demonstrates, the 1971 UI reforms made the system more generous in this regard: only 17 rather than 24 weeks were required, in order to spend the rest of the year collecting UI.

The *MXYR* parameter was reduced temporarily during the 1982 and 1990-92 recessions, and there was a significant and more permanent reduction after the 1994 reforms. Before 1994 a worker in a region with 11.5% unemployment would have needed to work 16 weeks in order to be eligible for the 34 weeks of benefit required for the rest of the year: now that worker will have to work 24 weeks, receiving only 26 weeks of benefits. Thus instead of needing to work a third of the year, they now need to work half the year. Under the 1977 system such a person would have only needed 10 weeks of employment to get UI for the rest of the year, thereby spending only a fifth of the year in employment.

Table 3: Qualifying Weeks and Benefit Duration 1959-94.

	UI Regime				
	1959	1971	1977	1990	1994
UI Regions	1	16	48	62	62
Variable Entrance Requirement (M)	8*	8	10–14†	10-20	12-20
Maximum Weeks of Benefits (X)	52	51	50 - 38	50 - 35	50 - 36
Maximum Benefits if Minimally Qualified (D)	12*	44 - 26	42 - 14†	39-17	32-14
Ratio of above to VER (D/M)	1.50*	5.50 - 3.25	4.20 - 1.00	3.90 - 0.85	2.67 - 0.70
Minimum Weeks of Work to ensure rest of year on UI	24 - 34	8 - 20	10 - 25	11 - 27	16 - 31

* As outlined in the previous section, qualifying weeks and benefit entitlement under the pre-1971 UI regime were calculated in a very different manner from subsequent regimes. Thus the figures above are only approximately comparable.

† These figures do not allow for the repeat use provisions introduced in July of 1977.

Another parameter that changed markedly between 1990 and 1994 is the number of weeks of benefits (*D*) that a claimant can expect once they have worked the minimum number of weeks. The 1971, 1977 and 1990 regimes had very similar values of *D* for a given unemployment rate, although the increase in unemployment between 1971–77 and 1977–90 meant that the typical claimant received much more in terms of benefit weeks. Under the 1994 regime the schedule has dropped markedly. This is also reflected in the ratio *D/M*, illustrated in figure 14. Indeed *D/M* has dropped much further than *D*, because it takes into account the increase in statutory entrance requirements since 1977.

Figure 12: Weeks of employment required to qualify (*M*), and to spend the rest of the Year on UI (*MXYR*).

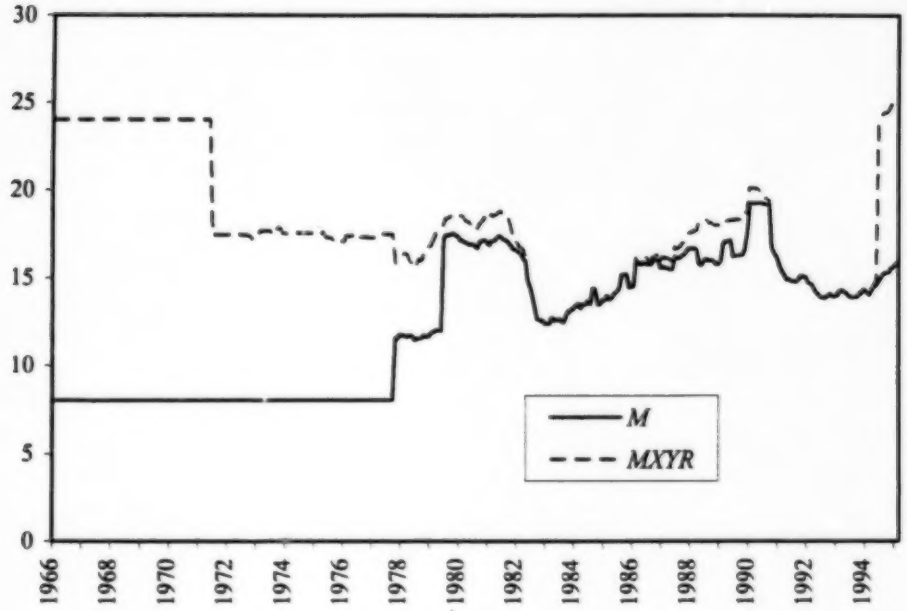


Figure 13: Weeks of Benefit given *M* Weeks of Work (*D*).

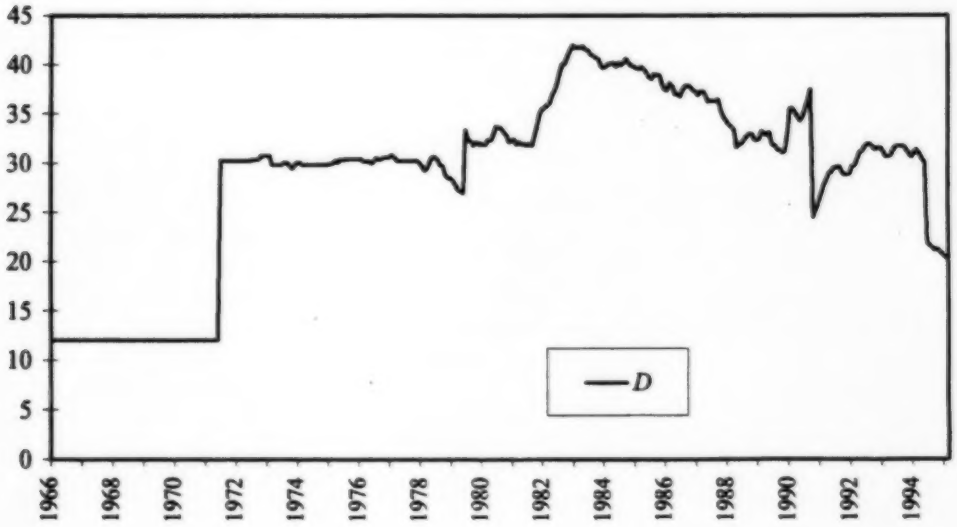
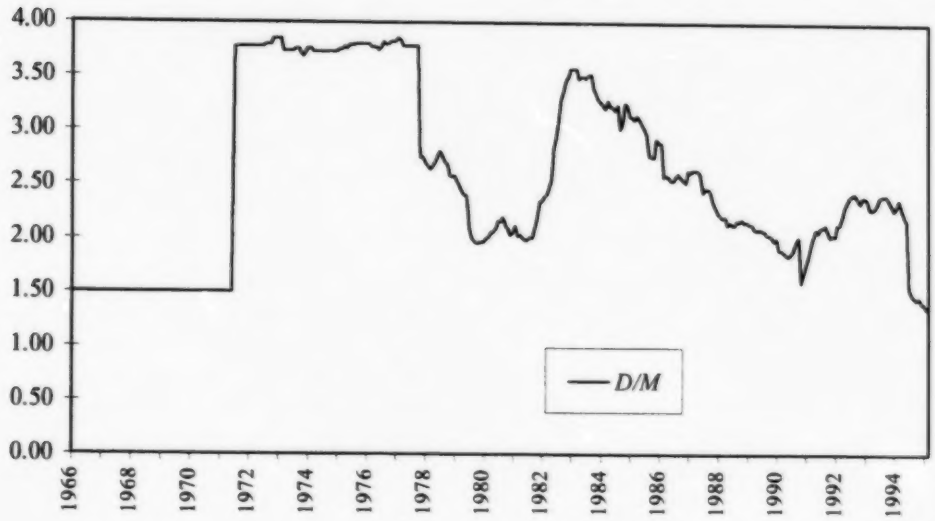


Figure 14: Ratio of Weeks of Benefit to Minimum Qualifying weeks (*D/M*)



4. Constructing the indices

In this section we shall discuss the empirical implementation of the two aggregate indices of UI disincentives discussed in section III. The first index assumes a completely flexible time horizon, and is defined as

$$u^{*} = \frac{D+A}{D+A+M}\left[1-\left(\frac{1-\rho D/(D+A))}{1+\rho D/M}\right)^{\theta}\right].$$

The second index assumes a 52 week time horizon (with only one spell of employment) and is given by

$$u^{52} = \left(1-\frac{M}{52}\right)\left[1-\left(\frac{1+\rho}{1+\rho D/M}\right)^{\theta}\right]+\left(1-\frac{MXYR}{52}\right)\left[\left(\frac{1+\rho}{1+\rho D/M}\right)^{\theta}-\left(\frac{1-\rho D/(D+A)}{1+\rho D/M}\right)^{\theta}\right]$$

To make these two measures operational we require an estimate of the Pareto distribution scale parameter θ. One way to do this would be to simply estimate one of the two expressions above. The problem with this approach is that the left hand side variable is UI induced unemployment, not total unemployment, which in general includes cyclical unemployment also as one of its components. Also the expression is quite non-linear, even in logarithms. An easier approach is to use the theoretical expression for the participation rate:

$$PR = 1 - F(\alpha_1) = \left(\frac{\alpha_0}{\alpha_1}\right)^{\theta}$$
$$= \left(\alpha_0 w^{\beta}(1+\rho D/M)\right)^{\theta}.$$

Taking logarithms one has

$$\ln PR = c_0 + c_1 \ln w + c_2 \ln(1+\rho D/M)$$

where $\theta = c_1$,
$\beta = c_2$,
and $\alpha_0 = \exp(c_0/c_1)$.

We estimated this equation by OLS using annual data for the period 1950-94. The resulting estimates were

$$\ln PR = -0.492 + 0.021 \ln w + 0.252 \ln(1+\rho D/M)$$
$$\quad (-10.4) \quad (0.44) \qquad (3.99)$$
$$R^2 = 0.70$$

The coefficient on the log wage was small and insignificant. Thus we set $\beta = 0$ and re-estimated. The results were

$$\ln PR = -0.669 + 0.199 \ln(1+\rho D/M)$$
$$\quad (-36.8) \quad (8.24)$$

$$R^2 = 0.59$$

This fitted value of θ was then used in the construction of the two indices. The index was calculated for each UI region, and then aggregated using regional population of working age as a weight.

In the next section we will illustrate how the index may be used to compare UI systems across provinces, over time, and across countries.

V. Applications and extensions of the index

The purpose of this section is to illustrate how the index developed in previous sections can be used to compare UI programs across time, countries, and regions. Subsection 1 examines the entire history of the Canadian UI program using the index. The second subsection breaks up the index into its regional components to examine relative UI disincentives across provinces. Finally we use the index to compare the Canadian system to those in France, Germany and the United States, and also make projections for the level of disincentives of the system under the Government's latest reform proposals.

1. The Canadian UI system over time

The constructed indices are presented in figure 15, normalised so that 100 is the level of disincentives of the system for someone with a flexible time horizon in 1970. There is little difference in the time series behaviour of the two series. The main difference occurs before 1971 when there is a 10 percent gap between the two. This arises because before 1971 a seasonal worker wishing to spend all of his unemployed time collecting UI would have to work significantly longer than the 8 week entrance requirement prevailing in this period. This meant that they would have a lower unemployment duration over the year than a worker who was free to adjust his time horizon. One interesting feature of the graph is the significant increase in the index for non-seasonal workers that took place in the mid 1950s. This was largely due to an increase in the maximum weeks of benefits available. Coverage (which is not allowed for in this version of the index) also expanded significantly between 1946 and 1955, from about 40% to about 60% of the workforce. These changes are smaller than those that occurred in 1971, but are roughly similar to the other big increase in disincentives which took place in 1982 owing entirely to the recession. The position of seasonal workers changed less dramatically before 1971, partly because, as explained in appendix B, there was a separate system for seasonal workers.

The 1971 reforms increased UI disincentives by almost 250%. By 1978 further reforms to the system had reduced disincentives to about 120. However, the 1982 recession increased disincentives once again, by about 50 percentage points. With the recovery, disincentives fell, gradually returning to the 1979 level.

The increase in disincentives due to the 1990-92 recession was largely offset by the 1990 reforms. Since then, there have been two further changes in the system, the 1993 reforms, which reduced the index by 10 percentage points, and the 1994 reforms, which reduced the index by more than 30 percentage points. Because of these changes, and because unemployment has fallen somewhat since the recession, the index in August of 1995 stood at 99% of its 1970 level. Thus the aggregate effects of the 1971 reforms upon UI induced unemployment would seem to have been eliminated.

Figure 15: Indices of UI Disincentives 1946–94.

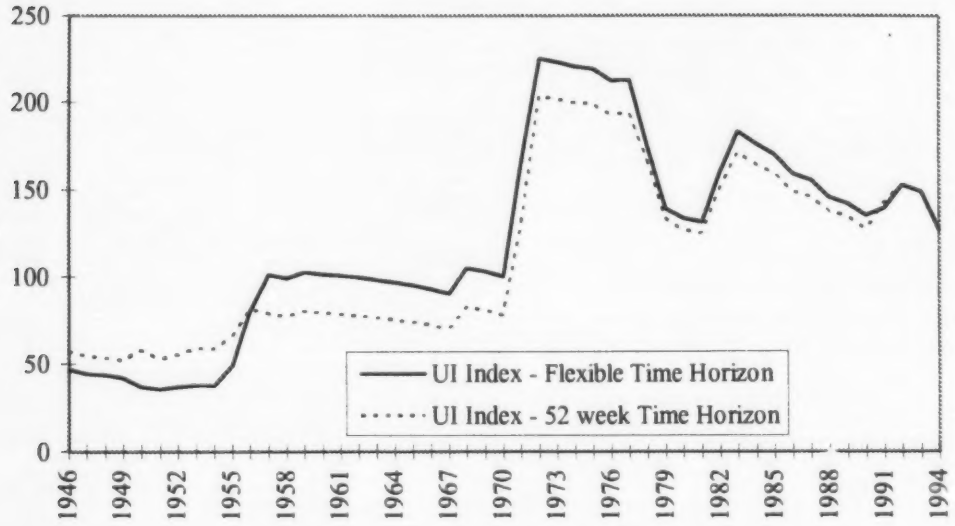
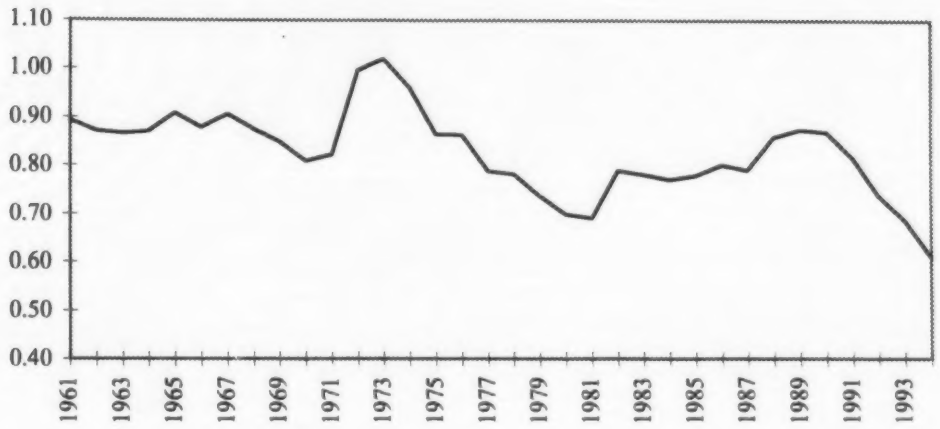


Table 4: UI Disincentives in Canada under different Regimes.

System	Unemployment Rate	Average Rep Rate	Min Weeks to Qualify	Weeks of Benefit	Index of Disincentives
1950 system, seasonal benefits	3.6	0.34	15	16	58
1950 system, regular benefits	3.6	0.43	34	17	37
1970 system	5.7	0.48	8	12	100
1972 system	6.2	0.64	8	30	242
1978 system	8.3	0.60	12	30	183
1993 system	11.2	0.55	14	31	153
August 1995 system	9.6	0.53	16	20	99
1994 system, no REB	9.6	0.53	16	12	66
1994 system, VER=20	9.6	0.53	20	23	90

Figure 16: Ratio of Regular Beneficiaries to the Unemployed.



On average the disincentives of the system are little different from that existing before 1971. Although our measure of the replacement rate is somewhat higher, this is compensated for by less generous benefit duration and qualifying requirements. This conclusion is somewhat at odds with the conventional wisdom, as expressed in the standard measures of UI disincentives. This is partly because of the exaggerated importance of the increase in coverage, but it is mostly due to misconceptions regarding the pre-71 benefit system. Most authors (e.g. Card and Riddell 1993, table 1) assume that 30 weeks of work were required to obtain a minimum of 15 weeks of benefits, giving a *D/M* ratio of 0.5. In actual fact, as Appendix B demonstrates, only 8 weeks of work since the last claim were required, giving 12 weeks of benefits and a maximum *D/M* ratio of 1.5.

One way of examining our claim that the system is now little more generous than in 1970 is to examine the ratio of recipients of regular benefits to those reported as unemployed by the Labour Force Survey. At only 61% of the unemployed in 1961 the B/U ratio is at a 30 year low. This is especially significant because it is likely that as the recovery continues the pool of unemployed will be disproportionately composed of those with longer unemployment durations whose benefits have expired. Thus ex post the benefit system seems to be less generous than before, at least as measured by the B/U ratio. It is important to remember that this ratio need not equal one even if every unemployed person was receiving UI. For example there are those who have stopped looking for work, or who are earning money but not enough to disqualify them from receiving UI. These persons would be counted by the LFS as out of the labour force and employed respectively[5].

[5]For further information see Levesque (1989)

Figure 17: Ratio of Regular UI Beneficiaries to Unemployed by Province.

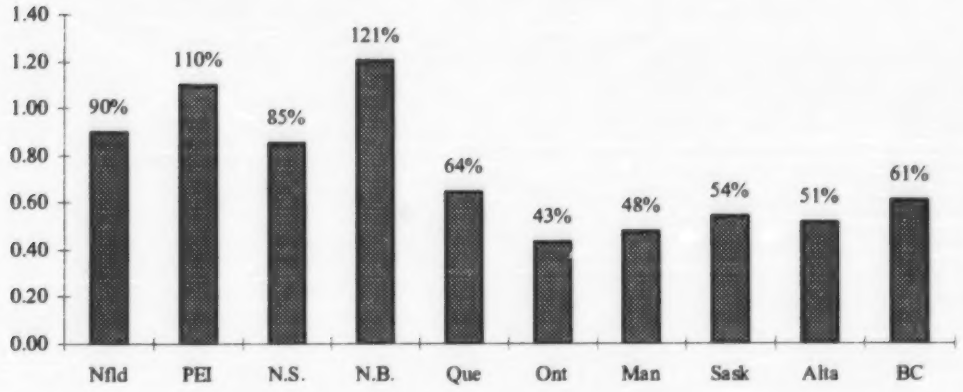


Figure 18: UI Disincentives by Province, June 1995.

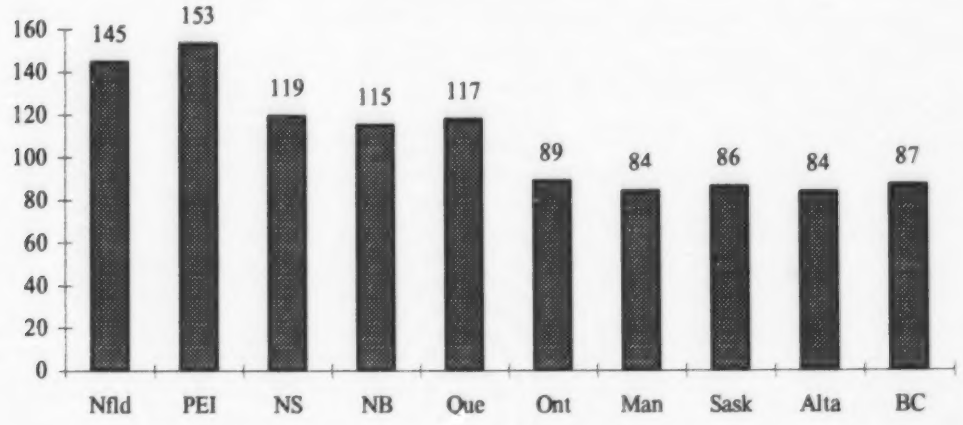
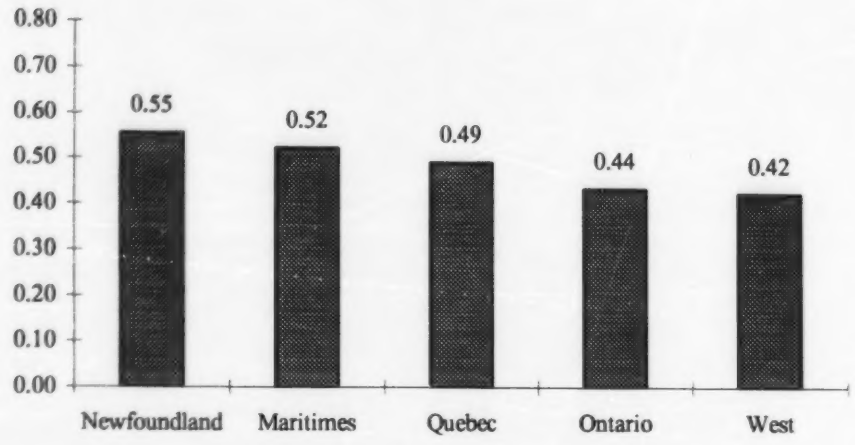


Figure 19: UI Disincentives in June 1995 relative to 1972.



2. Relative UI disincentives across provinces

In figure 18 above we show the level of the UI disincentives index for each province, normalised as before so that 100 is the level for Canada as a whole in 1970. There is quite a wide disparity between Quebec and the Atlantic provinces (115–153), and Ontario and the West (84–89). This is, of course, due to the disparity in provincial unemployment rates, in conjunction with the design of the unemployment insurance system. The regional variation of the system is in part designed to allow people in areas with high unemployment a longer period to find a job. To see whether this wide variation in disincentives is warranted, it is instructive to examine the B/U ratio by province. As figure 17 shows, the Atlantic provinces and to some extent Quebec have a much higher proportion of their unemployed in receipt of benefit than in Ontario or the West.

Another perspective on this result is provided by figure 19. This bar chart compares the disincentives of the UI system now with that in 1972, just after the 1971 reforms took effect. Interestingly, the system has become much less generous in Ontario and the West than elsewhere, despite the 1994 reforms. Part of the reason for this result is that the 1977 reforms actually increased regional disparities in some ways by introducing variable entrance requirements, instead of the uniform eight weeks qualifying period that had hitherto existed.

Figure 20: Provincial UI Disincentives relative to the Canadian Average.

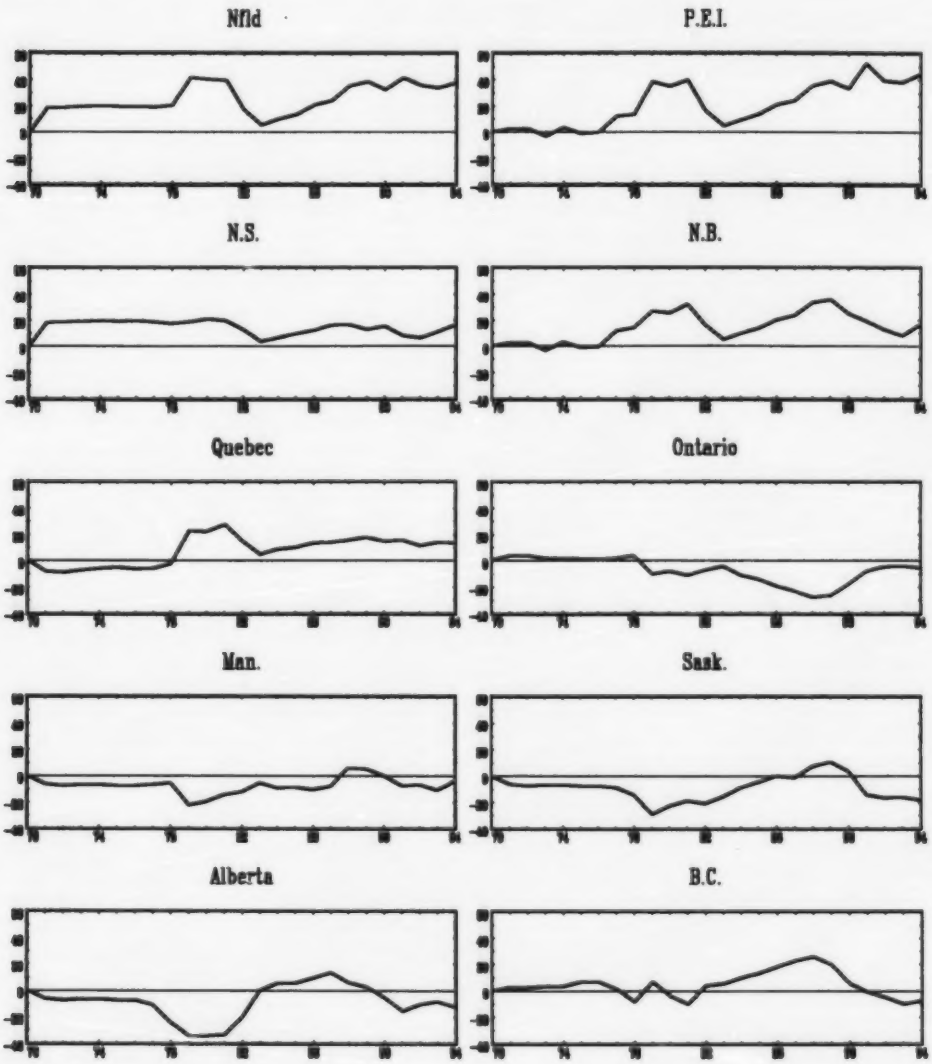


Figure 20 illustrates the variation in the index over time for each of the ten provinces, relative to the national average. The variation is of course due to the dependence of benefit regulations upon a claimant's UI region, and therefore greater UI disincentives than the national average corresponds to greater unemployment relative to the average. As the graphs show, there has been considerable volatility in relative disincentives, especially since the 1978 changes to the benefit regulations. Differences of +/– 40% between the level of the index of a province and the national average are not uncommon, and often the there can be significant changes in the space of a year. For instance relative disincentives in Newfoundland dropped from 40% higher than average to

Table 5: International Comparisons of Canada's UI system

System	Unemployment Rate	Average Rep Rate	Weeks Worked	Weeks of Benefit	Index of Disincentives
Present System - August 1995	9.6	0.53	16	20	99
System in 1977	8.1	0.59	8	30	213
System in 1957	4.6	0.47	8	12	101
US System					
NY State	8.1	0.48	20	39	121
Typical State	5.4	0.55	32	19	56
with Cdn unplyt rate	9.6	0.55	27	24	78
Germany (western)	8.2	0.65	26	13	61
France	12.6	0.45	26	65	135

virtually zero during the 1982 slump. This was due partly to a decrease in relative unemployment due to the recession elsewhere in the country, but also because the non-linear nature of the benefit system means that increases in unemployment in high unemployment regions have much less effect on disincentives than increases in low unemployment regions. It is also interesting to note that the extent of regional variation does not seem to have been dampened by the post-1990 reforms of the UI system.

3. Comparing Canada to other countries

Comparing institutions across countries is always a hazardous activity, simply because the economic, political and social circumstances can be so very different. Simple economic models of the kind used in this paper are of course only approximations to reality, and this approximation may be much better for some countries rather than others. Nevertheless, we believe that the exercise has merit, in part because the relevant consideration for public policy in Canada may not be 'what is the level of labour market disincentives in France,' but rather 'how distortionary would the French system be if it were to be introduced into Canada.' Also, we have chosen three countries, France, Germany and the United States, which have UI systems that are not dissimilar to Canada's. All have replacement rates that are a function of the previous wage, all require qualifying weeks of work and all limit the duration of benefits. See appendices B–D for a fuller description. Extending the index to a country such as Belgium, where benefit duration is effectively infinite, or the UK, where benefits are a fixed amount unrelated to the previous wage, would be much more difficult.

According to the index, the Canadian system is significantly more distortionary than that in Germany despite the higher replacement rate prevailing in the latter country. This is due to the comparatively low subsidy provided to marginally attached workers, who must work six months to qualify, which makes them eligible for three months of benefit. The Canadian system is also more distortionary than that in a typical U.S. state, according to the index., but not when compared to New York state, due to its

combination of high unemployment and a generous UI system. There is a caveat to this result however. U.S. unemployment insurance schemes are experience-rated to a certain degree, and thus individuals who attempt to maximise UI benefit receipt will increase the premiums paid by their firm. Thus the firm will have an incentive to offer a lower wage to marginally attached workers, assuming that it can identify who they are. The extent to which this happens will depend upon the incidence of the UI payroll tax, a subject of considerable debate at the moment. The US has a counterpart to Canada's Regional Extended Benefit system, known as Federal Extended Benefits, which increase the duration of benefits by 50% when the unemployment rate in a state is more than 6%. A typical US state in this situation would still have a level of disincentives significantly lower than that in Canada.

In contrast, France has a more generous system compared to Canada. Indeed the level of disincentives in the French system is similar to that prevailing in Canada before the 1982 or 1990-92 recessions. Long benefit entitlements are a general characteristic of UI schemes in North West Europe (excluding the UK). However, this must be put into context: employment and unemployment durations are very much longer, and typically many more weeks of work are required to qualify. In our theoretical framework what matters is the ratio between the two. In Germany, for example, an unemployed worker who is over the age of 53 can claim UI for 32 months. However, this person would need to have worked at least 64 months to qualify. In the German system the ratio between weeks of UI and weeks of work is never greater than one-half. In Canada this ratio is, on average, greater than one for workers who work the minimum weeks necessary to qualify. Thus the index predicts that Germany has an unemployment insurance system that produces fewer distortions than the Canadian system.

4. The 1995 proposals

Finally, in this section we estimate the change in the index resulting from the Government's latest proposals for reform of the unemployment insurance program (Government of Canada, 1995): the restructured program is referred to as the Employment Insurance program. The most important of the suggested changes are:

1. Maximum Insurable Earnings (MIE) for 1996 are set at $750 per week, rather than $845, a cut of 11%.

2. For repeat users, there will be a drop in the replacement rate of one percentage point for each twenty weeks of UI/EI use in the past five years. The maximum cut in the replacement rate is therefore 5 percentage points. However, low income claimants with families will receive a top-up based on the Child Tax Benefit.

3. For the purposes of calculating benefits, earnings over the last twenty weeks are averaged, whether the claimant was working or not. This reduces the replacement rate for those who work less than twenty weeks.

4. The income tax clawback is to be extended. Repeat claimants (with over twenty weeks of benefits) will face a clawback of up to 100% if their earnings are greater

than the MIE. The extent of the clawback depends upon the number of weeks of UI claimed in the last five years.

The practical impact of proposal 3 will be to provide a strong incentive to work twenty weeks. However, it is important to bear in mind that extra weeks of work qualify one for extra weeks of benefit, increasing the use of the system. Note also that the new system is being phased in over a six year period. Because we do not know what labour market conditions will be in six year's time, we also do not know what the precise parameters of the UI system will be. Thus the impacts we describe represent the effect on the index, assuming the current rate of unemployment and level of wages.

The results of incorporating the first three proposals into the index of UI disincentives are illustrated in table 6. Measuring the impact of the first two proposals upon the index is quite straightforward, as they do not represent a major break with the current system. Our estimates of the impact of the third proposal are more tentative. This is because the hours-based system of calculating eligibility is radically different from anything that has been tried before in the Canadian UI system. In theory, those who work less than 20 weeks should increase the length of their employment spells to twenty weeks in order to escape a reduction in the replacement rate. This is what is assumed in the index, because it would be optimal behaviour for an agent, given our assumptions[6]. However, in practice, the extent to which this would happen is not clear, particularly when the labour market is weak, so that opportunities for extending work to the 20 weeks requirement may be limited.

Table 6: Impact of proposed UI reforms on the index of UI disincentives

System	Unemployment Rate	Average Rep Rate	Weeks Worked	Weeks of Benefit	Index of Disincentives
Pre-94 System - June 1994	10.3	0.55	14.6	30.1	140.2
1994 System - July 1994	10.2	0.53	14.9	21.9	108.9
Present System - August 1995	9.6	0.53	15.8	20.3	98.8
Proposed Reforms:					
(1) 11% drop in MIE		0.52	15.8	20.3	96.6
(2) 50% rep. rate		0.49	15.8	20.3	91.8
(3) Hours based system		0.53	20.0	22.7	89.2
Whole Package		0.48	20.0	22.7	80.4
System in 1977	8.1	0.59	8.0	30.4	212.9
System in 1957	4.6	0.47	8.0	12.0	100.9

[6] To see this, let W be the number of weeks worked, $D(W)$ the number of weeks of UI for W weeks work, ρ the replacement rate and M the number of weeks to qualify. The person will try to maximize the UI subsidy, $\rho \cdot D(W)/W$. Under the current system, this ratio would be maximized by working the minimum number of weeks M. Under the new EI system, however, the replacement rate is multiplied by the number of weeks worked divided by 20. The UI subsidy is therefore given by $[\rho \cdot D(W)/W] \cdot W/20 = \rho \cdot D(W)/20$. Under these circumstances it is clear that the person will want to set W equal to 20, at which point the replacement rate is no longer adjusted for weeks worked, and there is no further incentive to increase weeks worked..

Estimating the impact of the fourth proposal, a change in the income tax clawback, is complicated, because it depends upon all income, not just employment earnings. For this reason the current version of the index does not include the existing income tax clawback, and so we do not consider the effects of clawback changes. However, because the clawback will only apply when *net* income is over the MIE limit, the impact of this change on the index would be small.

Taking the various reform proposals separately, the drop in the MIE has the smallest effect upon the index. This is hardly surprising, because most people earn less than the MIE limit and would continue to do so. The drop in the replacement rate represents a greater drop in disincentives, on the order of 7%, but it is the hours-based system which potentially has the greatest effect, reducing disincentives by 10%. Taken together the changes would reduce disincentives by 19%, lowering the index to 80. This is somewhat below the level of the system after the reforms in 1956, and is well below anything that has been seen since then.

VI. Conclusions

This study set out to produce a summary measure of UI disincentives that could be used to compare UI systems across time and space. The yardstick we chose to use was the amount of unemployment that the UI system would produce in a classical labour market model in which agents had complete control over their employment patterns.

An important advantage of the index is that it enables one to combine information about replacement rates and benefit duration in a coherent way that takes account of the heterogeneity of the labour force. The problem with many indices in the literature is that they model the incentives facing only some sections of the labour force. For example, the Fortin index incorporates the subsidy rate to marginally-attached workers only, and therefore overstates the importance of the benefit duration parameters, which are not relevant to strongly attached workers. The price paid for modelling this heterogeneity in labour force attachment was the need to assume a particular functional form for the distribution of preferences.

An important issue in the construction of the index is coverage. We argued in section IV that the extension of coverage in 1971 seems unlikely to have increased pro rata the impact of the UI system upon unemployment in the Canadian economy. In any event, including coverage would likely not change the time series behaviour of the index to any significant extent.

Another possible criticism is that although the index assumes that individuals exhaust their benefit entitlement, in reality most do not. However, several papers (e.g. Meyer 1990) show that the probability of leaving unemployment rises dramatically as the expiration date of benefits approaches. This is what one would expect from a search theory perspective: the offer acceptance rate will rise as the termination date approaches, often quite dramatically (see Lancaster 1990, p.135 for a simple example).

In section V we put the index to use. It was found that the reforms to the Canadian system have produced steadily smaller disincentives over time. The index of disincentives is now very similar the level existing before the 1971 reforms. The paper also shows that the 1994 budget and the proposed new reforms should lead to significant drops in the index of disincentives. The index also enabled us to characterise the significant disparity in disincentives across regions which is a particular feature of the Canadian system.

Appendix A: Chronology of the Canadian UI program

August 7, 1940	UI Act assented to.
July 7, 1941	Contributions begin.
February 28, 1950	Supplementary Benefit introduced. Benefits are payable at 80% of the regular rate during the period January 1–March 31 for those who have exhausted regular benefits or who are not eligible but have at least 15 weeks of contributions.
July 1950	Regulations regarding repeat claimants are somewhat relaxed.
1952	Supplementary benefit period extended to April 15. Waiting period reduced to 5 days.
October 2, 1955	New UI Act comes into force. Supplementary Benefit renamed Seasonal Benefit and the benefit rate is increased to that of regular benefits.
September 30, 1956	Regulations regarding repeat claimants relaxed. Only 24 rather than 30 weeks of contributions in the last year or since the last claim are required.
November 1957	Seasonal Benefit period extended to the period December 1 to May 15.
September 27, 1959	Maximum benefit duration increased to 52 weeks.
June 27, 1971	The 1971 UI Act comes into force.
February 2, 1972	Universal coverage begins.

January 1, 1976	Bill C-69 takes effect. The replacement rate for those with dependants is reduced from 75% to 67%, the disqualification period for those who quit or who were fired is doubled to six weeks, and the maximum age for coverage was reduced to 65 from 70.
September 11, 1977	Benefit Schedule changed. Maximum benefit duration is now 50 weeks.
December 4, 1977	The previous requirement of 8 weeks of insurable employment is replaced by a variable entrance requirement, which depends upon the local unemployment rate.
November 11, 1978	The 16 UI regions are replaced with 48 new regions.
January1, 1979	Under Bill C-14 the benefit rate is reduced from 66 2/3% to 60% of insurable earnings, and benefits for high-income claimants become subject to an income tax claw-back .
July 1, 1979	New entrants or re-entrants now required to have 20 weeks employment in the last year. Repeat claimants are now required to have up to six extra weeks of work, if the unemployment rate in their region is below 11%.
February 11, 1990	Owing to a dispute between the Senate and the Commons over the GST, the recurring legislation that permits variable entrance requirements is not passed. Entrance requirements revert to a uniform 14 weeks.
November 18, 1990	Bill C-21 becomes effective. Benefit duration schedule changed. Repeaters are no longer required to work up to six extra weeks. The number of UI Regions is increased to 60. Those who quit are now disqualified for six to twelve weeks, and their benefit rate is reduced from 60% to 50%.

April 4, 1993	Under Bill C-121 those who quit without just cause or who are fired for misconduct are no longer eligible for UI benefits. The replacement rate is reduced to 57%.
July 7, 1994	Benefit duration schedule is changed again, and the replacement rate is lowered to 55%, except for those with dependants and earnings of less than half maximum insurable earnings.
December 1, 1995	Details of the new Employment Insurance scheme are revealed. Among the numerous changes are a reduction in the MIE, lower replacement rates for repeat users, entrance requirements and benfit duration to be based on hours of work rather than weeks, extension of the income tax clawback and an additional family income supplement based on the Child Tax Benefit.

Appendix B: The UI System in Canada before 1971

The UI program before the 1971 UI Act was in many ways quite different from its successors. In particular, the way in which weeks of work were translated into weeks of benefits was very different from the post-1971 system. For example the reference period for determining eligibility was the last two years rather than the last year. In addition there was a system of seasonal benefits payable during the winter months. These differences mean that the particular measures of unemployment disincentives developed in section III for the post-1971 system need to be modified for the period before 1971.

Under the 1955 UI Act, as amended in 1956, the qualification conditions for benefit were as follows. If a claimant had had no previous benefit period established in the last 104 weeks preceding their claim, then they must have worked at least 30 weeks in the last 104 weeks, and at least 8 weeks in the last 52 weeks. The duration of benefits was equal to half the number of weeks worked in the last 104. Thus the minimum benefit duration was 15 weeks and the maximum 52 weeks. For repeat claimants, the eligibility requirement was that they must have worked at least 30 weeks out of the last 104, with at least 24 of these weeks in the last 52 weeks or since the start of the last benefit period, whichever was longer, and at least 8 of the weeks in the last 52 weeks or since the start of the last benefit period, whichever was shorter. A claimant would receive one week of benefit for every two contribution weeks in the last 52 weeks or since the start of the last benefit period, whichever was *longer*. Note that this means that weeks of work *before* the last claim might help establish eligibility for the current claim, thus enabling a claimant to use the *same* contribution weeks for several claims. Because of this the minimum benefit duration was 12 weeks (see Report of the Committee of Inquiry into the Unemployment Insurance Act, 1962, chap. 2, paras. 54-55).

This dependence of benefit duration upon employment before a previous spell of unemployment means that the paramters used in the index have to be modified. In particular, it is no longer clear what is the correct minimum weeks measure to use. Is it 8 weeks, the minimum since the last claim, or 30, the minimum in the last 2 years? In figure 21 we illustrate the efficient income-employment frontier for a non-seasonal worker under the 1956 program. The key difference between this diagram and the frontier for the post-1971 UI program is that the marginal subsidy to extra employment $(1+\rho D/M)$ is not constant but varies. For very high values of u it is equal to $(1+\rho \cdot 15/30)$. This is because high rates of unemployment require very long time horizons, implying that employment spells prior to the one preceding the current claim will be too far in the past to count for the purposes of establishing benefit duration. Thus the ratio D/M is equal to 0.5. However at somewhat lower unemployment rates it is possible to obtain a much higher subsidy rate: indeed it is possible for the ratio D/M to be as high as 1.5.

Consider an agent who works for 8 weeks and has a time horizon of 21 weeks. Our claim is that this person would be eligible for UI and would be entitled to twelve weeks of benefit. Our reasoning is as follows:

Weeks worked in last 104 weeks = $40 \geq 30$

Weeks worked in last 52 weeks $= 24 \geq 24$

Weeks worked since last claim $= 8 \geq 8$.

$\Rightarrow$ Agent is eligible for UI

Duration of benefit = 0.5 × (Weeks worked in last 52 weeks) $= 24/2 = 12$.

This agent would therefore spend all their unemployed time either waiting for or claiming UI

The question then is which subsidy rate to use in an index of UI disincentives, the marginal rate for an agent deciding whether or not to participate at all in the labour market, i.e. the rate at $u = 1.0$, or the maximum subsidy rate? If one assumes linear preferences the answer is the latter, because with linear indifference curves the agent would locate at $u = 1$ or $u = u_C$, but not at any point in between. Note that this question is also germane to the post 1971 UI system, because since 1979 those with very low labour market attachment need twenty weeks of work to qualify for UI. This reduces the subsidy rate for agents with very high unemployment rates, but again, with linear preferences agents would gravitate towards the highest subsidy rate and ignore this region.

Under the original 1955 UI one required 30 rather than 24 weeks of employment in the last 52 weeks or since the start of the last claim, whichever was longer. This reduces the maximum subsidy rate to $(1+\rho)$.[7] The maximum subsidy rate under the 1950 UI program was $(1+\rho/2)$, assuming a work week of six days[8].

Determining the position of seasonal workers under the pre-1971 UI system is complicated by the existence of two different types of seasonal benefit. The first, known as type A seasonal benefit, was payable to those who were not ordinarily eligible for UI but who had worked at least 15 weeks since the end of the last seasonal period. Type B seasonal benefits were available to those whose regular benefits had been exhausted. The period over which benefits were payable was originally January 1 to March 15, but by 1957 it had been extended to the period December 1 to May 15.

In section III we argued that with linear utility those agents with a fixed time horizon of 52 weeks would congregate at four points on the income-unemployment frontier: 0, u_{mxyr}, u_{min} and 1. The unemployment rate u_{min} is the point at which the subsidy to employment is the highest, and u_{mxyr} is the point at which the subsidy becomes a tax, which is where the agent has no uncompensated unemployment time save for the waiting period. Previously u_{min} was the point at which the agent became eligible for benefits: this however need not be the case as table 7 above demonstrates. Indeed, as with the regular benefit system, the highest marginal subsidy to employment occurs at the *MXYR* point. With linear utility it is this point that is relevant for determining participation in the labour

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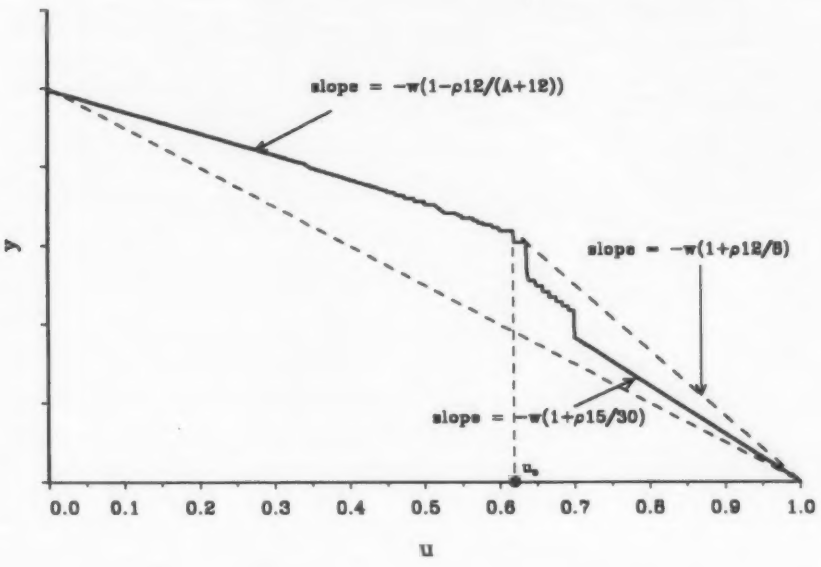
[7] In this case an agent would have a time horizon of 35 weeks, work for 16 weeks and be able to claim U.I. for 16 weeks.

[8] Benefit duration under the 1950 system was equal to the number of days worked in the last 5 years divided by 5, less the number of days of U.I. in the last 3 years divided by 3.

Figure 21: The Efficient Income Employment Frontier under the 1956 UI Program.



force. The aggregate unemployment rate for seasonal workers before 1971 is therefore given by

$$u^{52} = \frac{\left[F(\alpha_2) - F(\alpha_{mxyr})\right] \cdot u_{mxyr}}{1 - F(\alpha_{mxyr})}$$

Note that before 1955 the replacement rate for seasonal benefits was only 80% of the regular replacement rate, so in the empirical implementation this must be taken into account.

Table 7: Parameters of the Seasonal / Supplementary Benefit System 1952-70.

	1952	1955	1956	1957	1958	1959+
Length of Seasonal Benefit Period	16	16	16	24	30	24
Weeks of work to claim Type A (*M*)	15	15	15	15	15	15
Duration (*D*)	16	10	10	13	13	13
D/M	1.07	0.67	0.67	0.86	0.86	0.86
Weeks of work to claim Type B (*M*)	24	30	24	24	24	24
Duration (*D*)	27	21	27	27	27	27
Weeks of Seasonal Benefit actually used	15	6	15	15	15	15
D/M	1.13	0.7	1.13	1.13	1.13	1.13
Weeks of work to spend rest of year on UI (*MXYR*)	24	30	24	24	24	24

Sources: *Report of the Committee of Inquiry into the Unemployment Insurance Act (1962), Report of the Study of Updating the Unemployment Insurance Program (1968).*

Appendix C: The UI Systems in Germany and France

The UI system in Germany consists of two programs[9]. The first, Arbeitslosengeld (ALG), is closest to the Canadian model of unemployment insurance. It is funded by contributions from employees and employers, and benefits are related to the previous wage. The current replacement rate is 63% for those without dependent children and 68% otherwise. There is no waiting period. In order to qualify for ALG one must have worked at least one year in the previous three, or since the previous claim. Claimants who have just enough weeks to qualify receive one week of ALG for each two weeks of work. The maximum duration depends upon age, but in no case does the ratio of benefit weeks to work weeks exceed one-half. These regulations would make it very difficult for seasonal workers to use the system the same way as they do in Canada, however it should be noted that Germany has many fewer seasonal workers than Canada.

The other assistance scheme for the unemployed is Arbeitslosenhilfe (ALH). By Canadian standards this program is much closer to welfare than it is to unemployment insurance. Benefits depend not only upon the previous wage but also depend upon the income of other family members and the claimant's wealth. To qualify one requires 5 months of work, and benefits are indefinite. At any point in time only about 20% of the unemployed receive ALH, versus 55% for ALG (Hunt, 1995, p.92). We shall therefore focus exclusively on ALG.

As of 1991, the French UI system consisted of three tiers[10]. The first, Allocation de Base (AB), lasted for eight months, in the case of a claimant who qualified with a minimum of six months of work. Calculating replacement rates is somewhat difficult in the French system, because the schedule, while linear affine, is not proportional. The OECD calculates that at an 'intermediate' level of earnings, AB paid a replacement rate of 57%. The next stage, Allocation de Base Prologée (ABP) paid approximately 48% of the previous wage at an 'intermediate' level of earnings and lasted for 2 months, in this case. Note that this benefit was discretionary. Finally, there was Allocation en Fin des Droits (AFD), which lasted for 5 months, and paid a fixed amount equal to 25% of the 'intermediate' level of earnings. Together, these three tiers of UI provide a total of 15 months for an applicant with 6 months work experience in the last year. There is no waiting period, however those who quit are not entitled to benefits. For those with only three months of employment in the last year, there is Allocation de Base Exceptionelle (ABE). However, this is only available once every two years, and only pays 75% of the benefits payable under the AB/ABP/AFD scheme.

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[9] Our information about the German system is largely taken from Hunt (1995).

[10] Our information about the French system of unemployment insurance is taken from OECD (1991).

Appendix D: The UI System in the United States

The U.S. system of unemployment insurance differs from state to state. In what follows therefore we shall describe the system for a typical state, as described in Anderson and Meyer (1993), and for a more generous state, New York, as described in Osberg, Erksoy and Phipps (1994). Typical replacement rates are between 50% and 60% of after-tax income. However unlike the Canadian system this rate depends upon more than just weekly earnings. A typical benefit schedule would calculate the level of benefits B according to

$$B = \frac{HQE}{23}$$

where HQE is high quarter earnings. If Q_0 is the quarter when benefits are claimed, then

$$HQE = \max_{Q_{-4},\ldots,Q_{-2}} \{\text{Earnings in } Q_{-1}\}.$$

For someone who had worked all thirteen weeks in their high earnings quarter the replacement rate (subject to the *MIE*) would be 13/23 = 56.5%. However if the person had worked only seven weeks the replacement rate would be 7/23 = 30.4%. Weeks of UI are given by the formula

$$V = \min\left\{26, \frac{BPE}{3 \cdot B}\right\}.$$

where BPE is base period earnings, with

$$BPE = \sum_{Q_{-4}}^{Q_{-2}} \text{earnings in } Q_{-1}.$$

Thus weeks of UI can be written as

$$V = \min\left\{26, \frac{BPE}{HQE}\frac{23}{3}\right\}.$$

Under this system, someone who had worked only two quarters of the five in the base period would receive 2/3×23 ≅ 15 weeks of UI. It may seem that under these rules there is an incentive to manipulate work patterns to concentrate earnings in one quarter: however under this system the ratio between the total amount paid out ($V \cdot B$) and base period earnings is always 1/3 (up to the 26 week limit). Thus an agent who intends to exhaust their benefits would be indifferent to how their earnings were divided amongst quarters.

The subsidy rate ($\rho D/M$) to a marginally attached worker is therefore 1/3, and the replacement rate for a fully attached worker is 13/23 = 56.5%. The proportion of time spent unemployed ($D/(D+M)$) is 0.25.

There is also a system of Federal Extended Benefits (FEB), which are paid when a state's unemployment rate is above 6%. These benefits extend an individual's entitlement

by 50% or 13 weeks, whichever is less. This increases the subsidy rate to 1/2. Given current unemployment rates, however, most states are not eligible. The 1995 budget (p.615) shows that, while in 1993 FEB was about 36% of total benefits, the estimate for 1994 was only 13.2%.

The New York system is simple to describe. The replacement rate is 50%, and twenty weeks of insurable employment are needed to qualify. Anyone who qualifies is eligible to receive up to 26 weeks of benefits. This gives a subsidy rate of 0.65, compared to .33 for other states. With FEB this subsidy rate rises to about 1.00, which is higher than that currently prevailing in Canada.

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